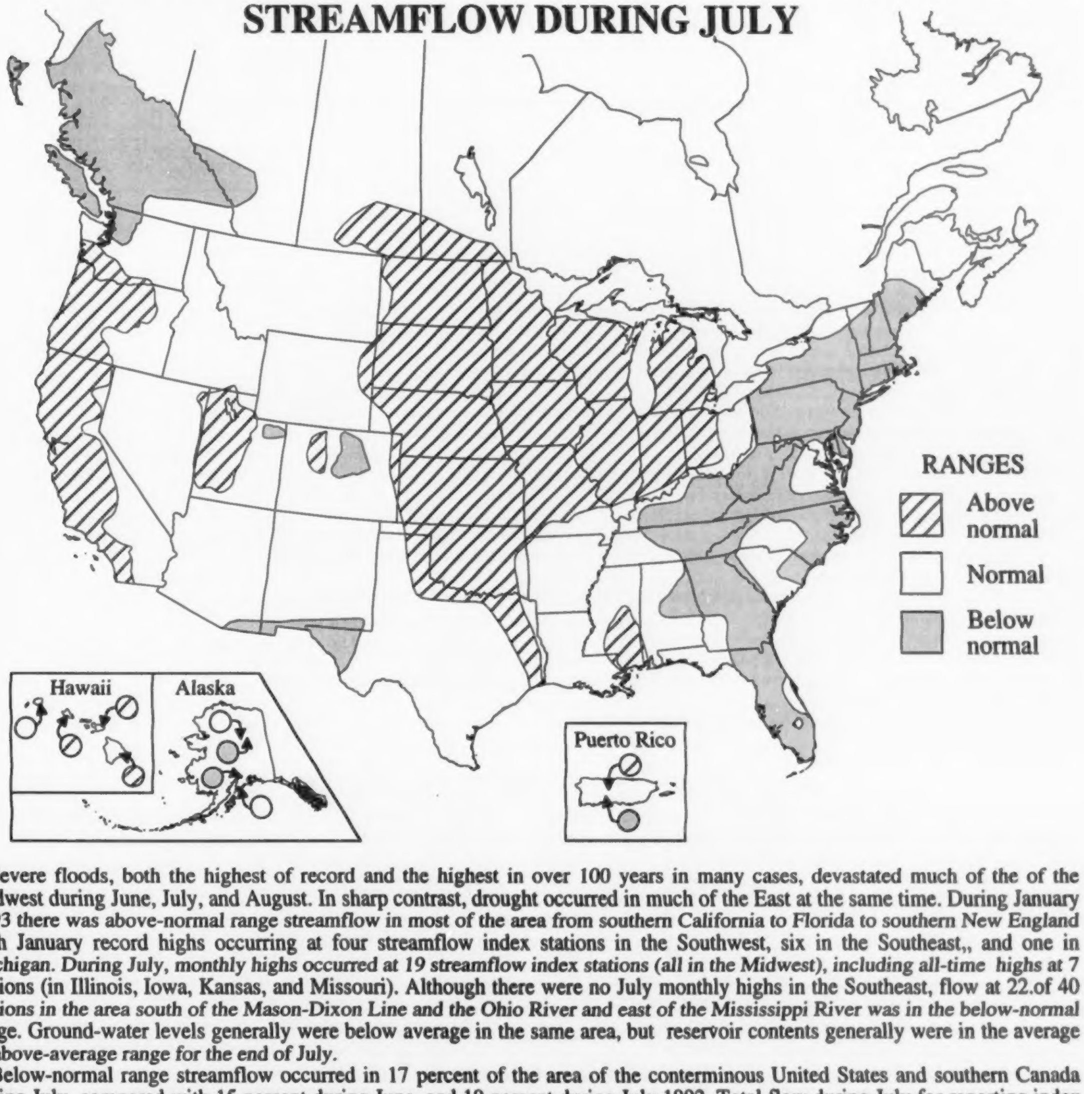
National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

JULY 1993

STREAMFLOW DURING JULY



Severe floods, both the highest of record and the highest in over 100 years in many cases, devastated much of the of the Midwest during June, July, and August. In sharp contrast, drought occurred in much of the East at the same time. During January 1993 there was above-normal range streamflow in most of the area from southern California to Florida to southern New England with January record highs occurring at four streamflow index stations in the Southwest, six in the Southeast,, and one in Michigan. During July, monthly highs occurred at 19 streamflow index stations (all in the Midwest), including all-time highs at 7 stations (in Illinois, Iowa, Kansas, and Missouri). Although there were no July monthly highs in the Southeast, flow at 22.of 40 stations in the area south of the Mason-Dixon Line and the Ohio River and east of the Mississippi River was in the below-normal range. Ground-water levels generally were below average in the same area, but reservoir contents generally were in the average to above-average range for the end of July.

Below-normal range streamflow occurred in 17 percent of the area of the conterminous United States and southern Canada during July, compared with 15 percent during June, and 19 percent during July 1992. Total flow during July for reporting index stations in the conterminous United States and southern Canada was 41 percent above median, 3 percent less than last month, and 29 percent more than flow during July 1992.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged about 43 percent above median and in the above-normal range, after an 8 percent decrease in flow from June to July. Flow of the St. Lawrence River was in the above-normal range for the ninth consecutive month after a 9 percent decrease from its June record high. Flow of the Mississippi River was in the above-normal range following a 4 percent increase from a normal range June. Flow of the Columbia River was in the normal range after a below-normal range June.

Mean July elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were in the normal range and above median on Lake Superior, Lake Huron, and Lake Erie, and in the above-normal range on Lake Ontario.

Utah's Great Salt Lake level fell 0.40 foot , ending the month at 4,201.50 feet above National Geodetic Vertical Datum. Lake level was 0.60 foot lower than at the end of July 1992, and 10.35 feet lower than the maximum of record.

EDITOR'S NOTE: This **July 1993** issue of the *National Water Conditions* has been published **before** the February-June 1993 issues because of the Midwest floods. (The February-June 1993 issues will be published, but on an intermittent schedule while the NWC staff works to publish issues which come after July 1993.) A detailed treatment of the floods in the NWC is impossible, given the magnitude and areal extent of the flooding. However, there are four pages (4-7) which give a general overview of flood conditions in this issue. U.S. Geological Survey Circular 1120, *Floods in the Upper Mississippi River Basin, 1993,* consists of individually published chapters (some of which have already been published) that will document the effects of the flooding.

CONTENTS

SURFACE-WATER CONDITIONS DURING JULY

July streamflow decreased from that for June at 139 index stations and increased at 45 index stations, resulting in normal or above-normal range streamflow at 71 percent of the 188 reporting index stations in the United States, southern Canada, and Puerto Rico during the month, compared with 79 percent last month and 80 percent during July 1992. [No data were reported for: St. Francois River at Hemmings Falls, Outardes River (adjusted) at Outardes Falls, and St. Maurice River (adjusted) at Grand Mere, Quebec, April-July 1993; Coulonge River near Fort Coulonge, Quebec, July 1993; Cape Fear River at William O. Huske Lock near Tarheel, North Carolina, June and July 1993; and Fraser River at Hope, British Columbia, June 1993.]

Below-normal range streamflow occurred in 17 percent of the area of the conterminous United States and southern Canada during July, compared with 15 percent during June, and 19 percent during July 1992. Total flow of 845,900 cubic feet per second (ft^3/s) during July for 170 reporting index stations in the conterminous United States and southern Canada was 41 percent above median, 3 percent less than last month, and 29 percent more than flow during July 1992.

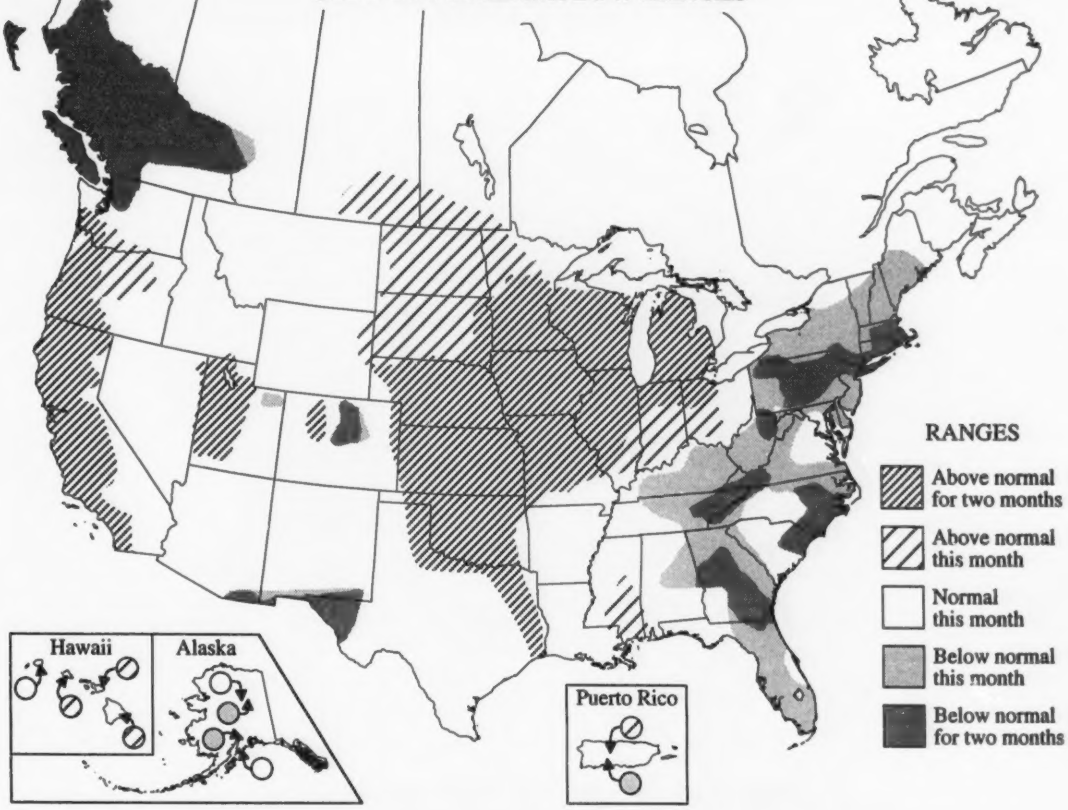
Nineteen new highs occurred during July, compared with ten new highs during June. No new lows occurred during either month. Hydrographs for the 19 streamflow stations at which the new extremes occurred—all in the area of the Midwest severely affected by flooding—are on pages 9-11.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 1,381,000 ft^3/s, about 43 percent above median and in the above-normal range, after an 8 percent decrease in flow from June to July. Flow of the St. Lawrence River was in the above-normal range for the ninth consecutive month after a 9 percent decrease from its June record high. Flow of the Mississippi River was in the above-normal range following a 4 percent increase from a normal range June. Flow of the Columbia River was in the normal range after a below-normal range June.

Month-end index reservoir contents were in the below-average range at 19 of 100 reporting sites, compared with 16 of 100 during June, and 31 of 100 at the end of July 1992, including most reservoirs in Massachusetts, New Jersey, North Dakota, Nebraska, Montana, Utah, and Nevada. Contents were in the above-average range at 44 reservoirs (compared with 52 last month, and 34 a year ago), including most reservoirs in Quebec, Maryland, South Carolina, the Tennessee Valley, Minnesota, South Dakota, Oklahoma, Texas, Idaho, Wyoming, California, and Arizona. There were no reservoirs with contents in the below-average range and significantly lower than last year (with normal maximum contents of at least 1,000,000 acre-feet). After 33 months of no usable storage, Lake Tahoe, California-Nevada, had water above the natural rim for the 2nd consecutive month.

(Continued on page 8)

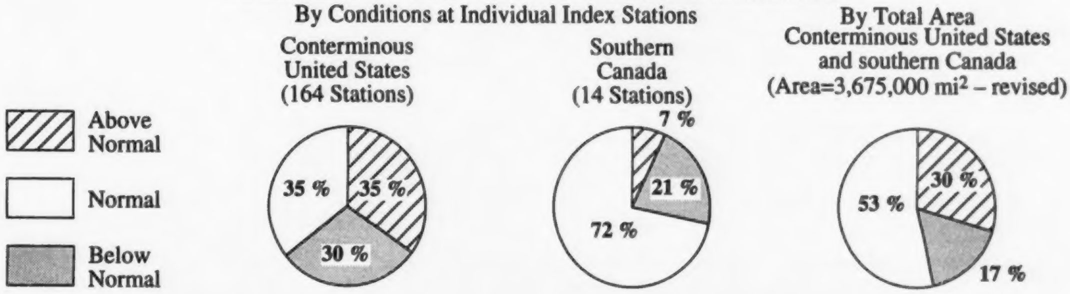
JULY 1993 STREAMFLOW RANGES



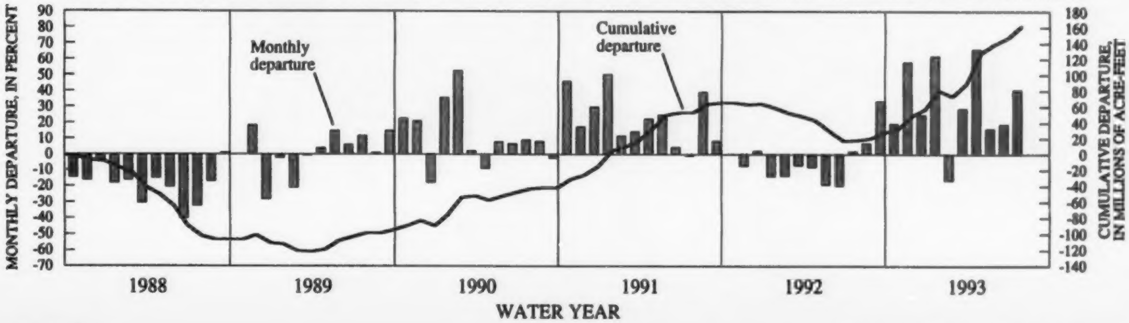
SUMMARY OF JULY 1993 STREAMFLOW RANGES

By Conditions at Individual Index Stations

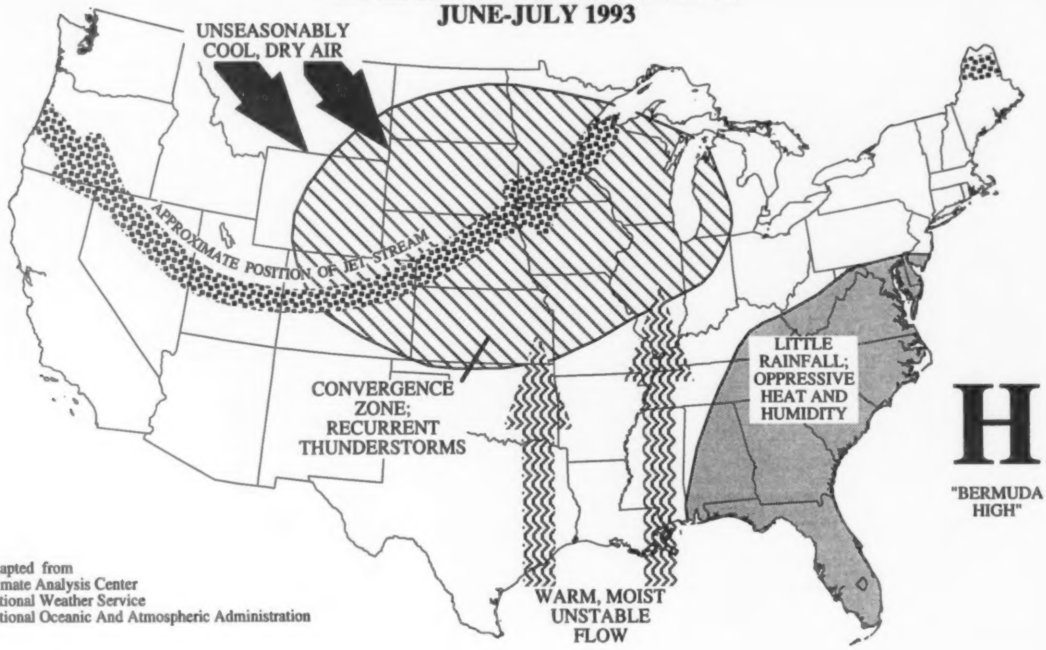
By Total Area



MONTHLY AND CUMULATIVE DEPARTURE OF TOTAL MONTHLY MEANS FROM TOTAL MONTHLY MEDIANS (1961-90) FOR INDEX STATIONS IN THE CONTERMINOUS UNITED STATES AND SOUTHERN CANADA

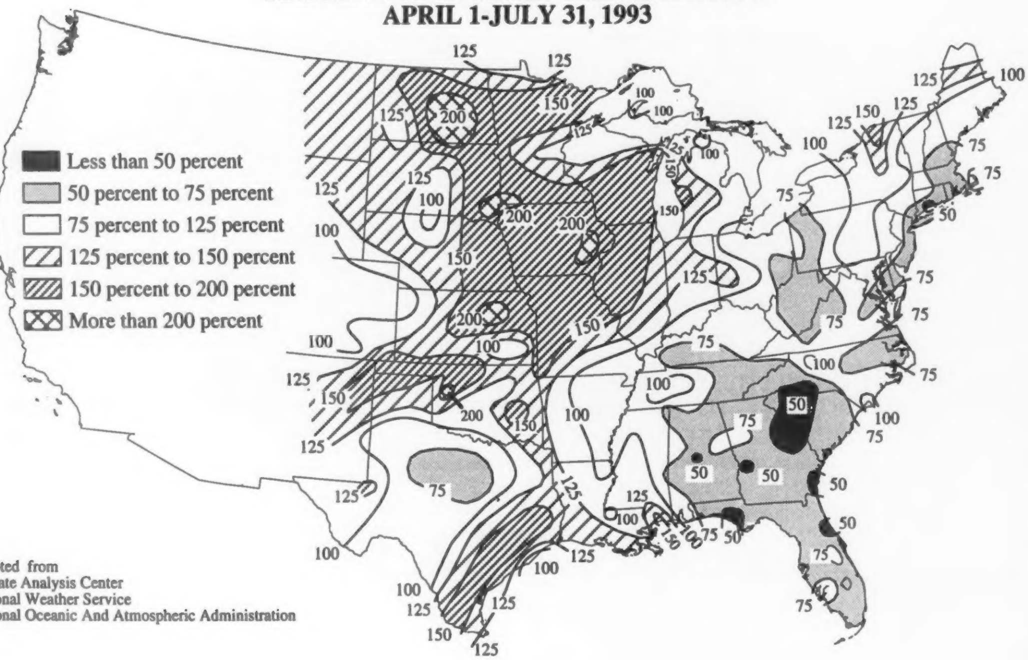


DOMINANT WEATHER PATTERN JUNE-JULY 1993



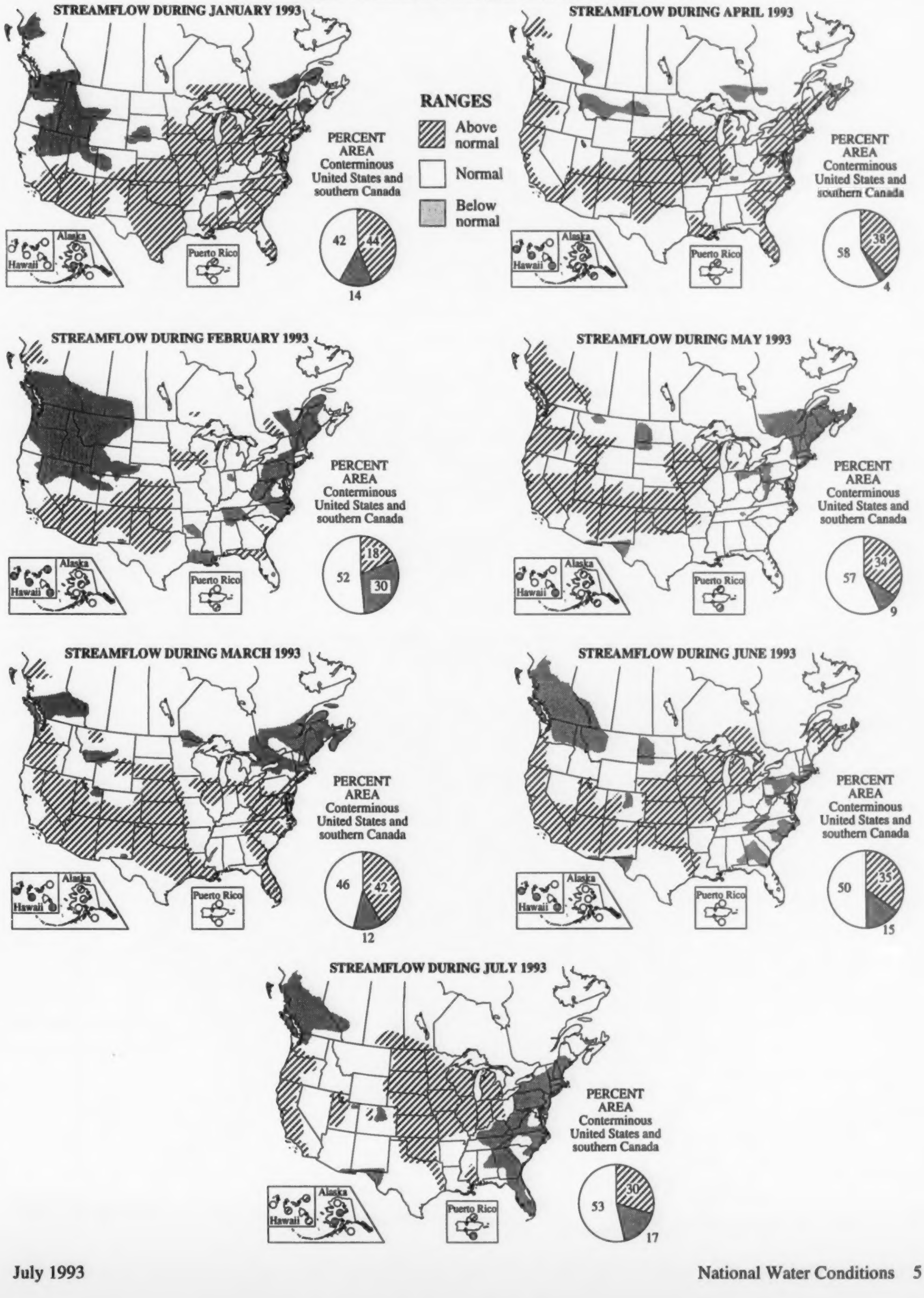
Adapted from
Climate Analysis Center
National Weather Service
National Oceanic And Atmospheric Administration

PERCENT OF NORMAL PRECIPITATION APRIL 1-JULY 31, 1993

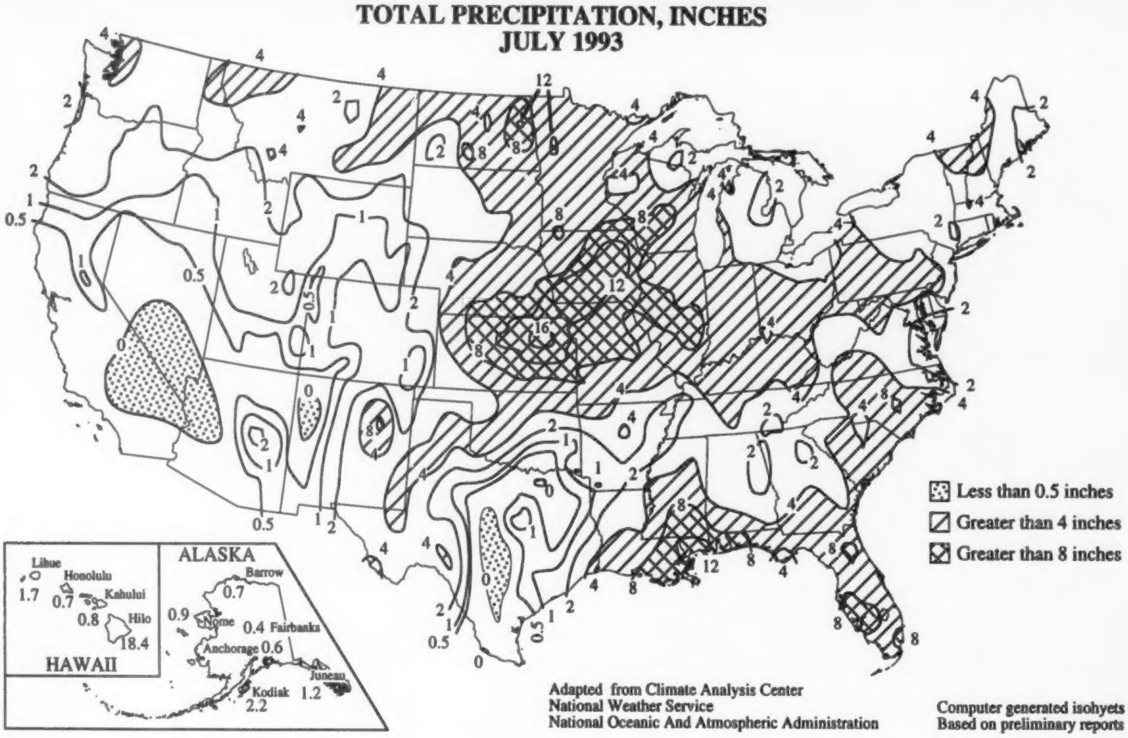


Adapted from
Climate Analysis Center
National Weather Service
National Oceanic And Atmospheric Administration

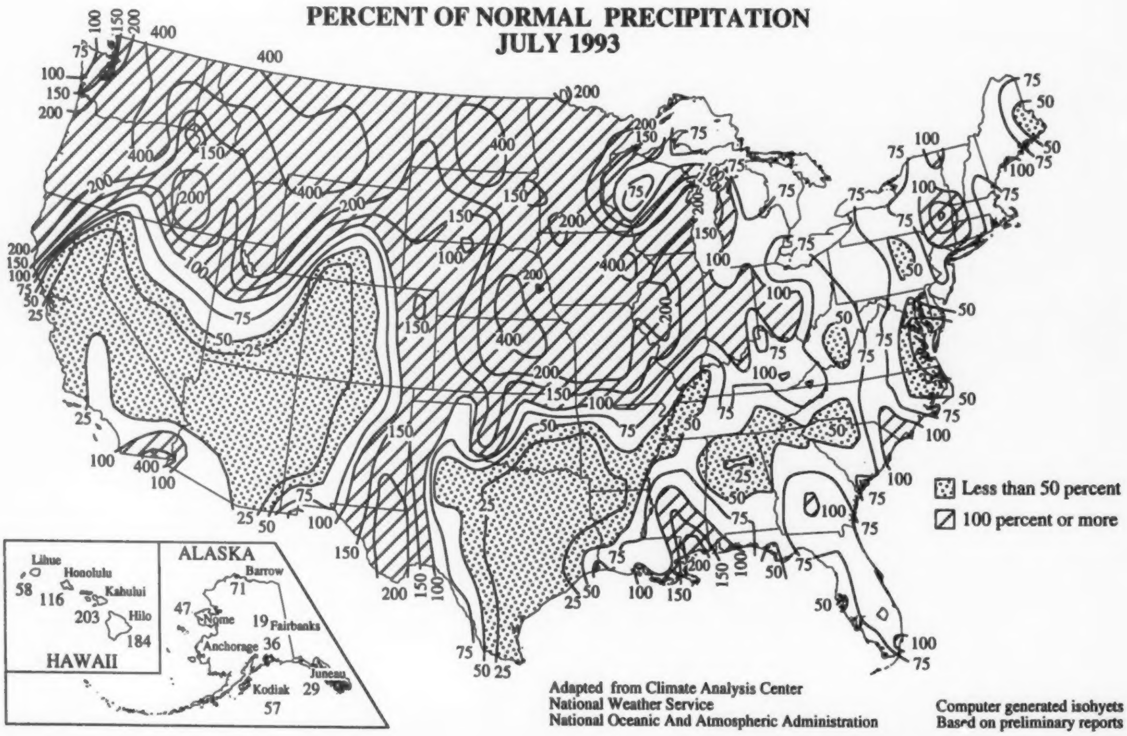
STREAMFLOW MAPS FOR JANUARY-JULY 1993



TOTAL PRECIPITATION, INCHES
JULY 1993

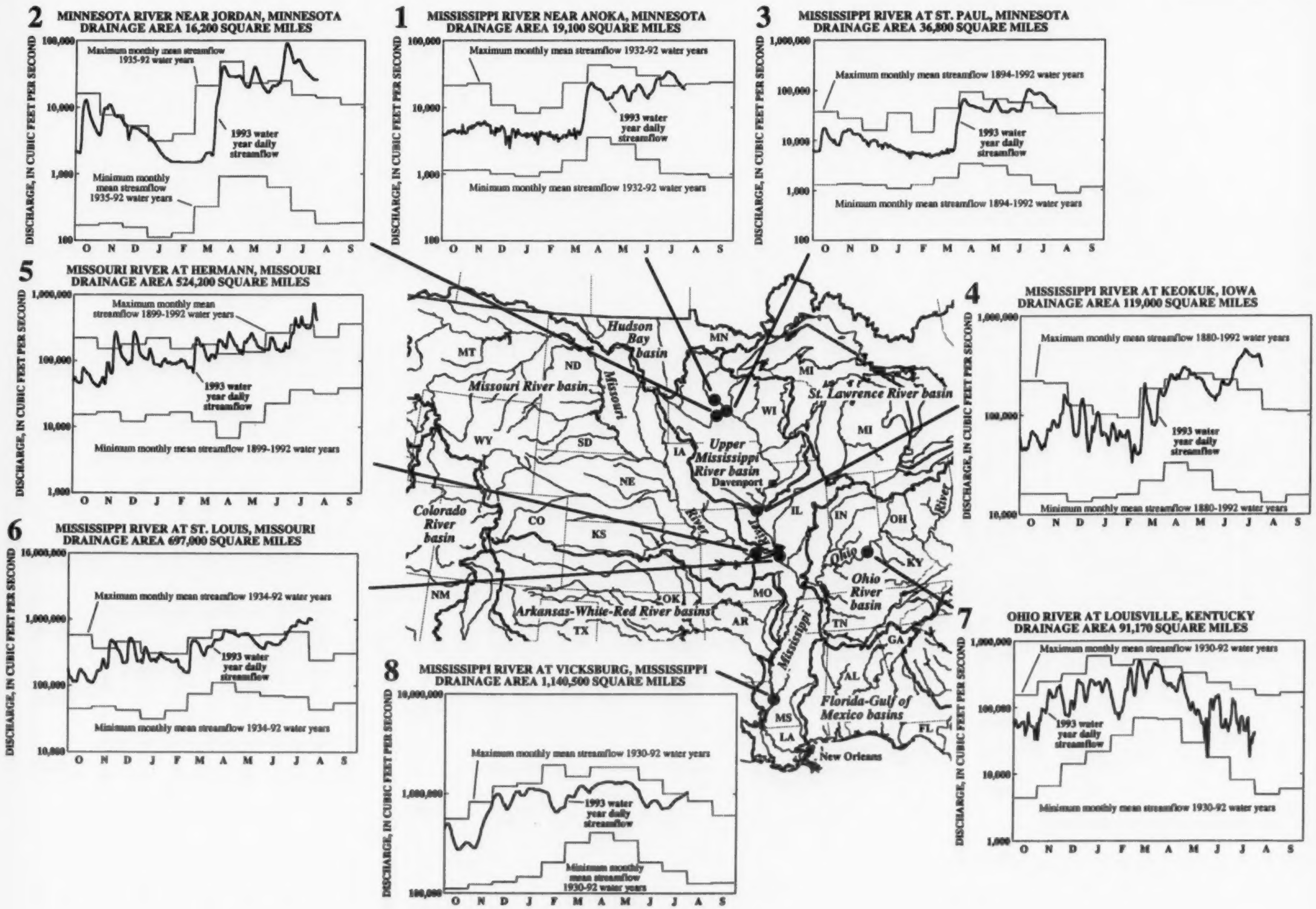


PERCENT OF NORMAL PRECIPITATION
JULY 1993



JUNE-AUGUST 1993 FLOODS IN THE MIDCONTINENT

Provisional data; subject to revision



(Continued from page 2)

Mean July elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were in the normal range and above median on Lake Superior, Lake Huron, and Lake Erie, and in the above-normal range on Lake Ontario. Levels rose from those for June on Lake Superior and Lake Huron and fell from those for June on Lake Erie and Lake Ontario. July levels ranged from 0.36 foot higher (Lake Huron) to 0.69 foot lower (Lake Ontario) than those for June. Monthly means have been in the normal range for 13 months on Lake Superior, 36 months on Lake Huron, and 3 months on Lake Erie, and in the above-normal range on Lake Ontario for 9 months. July 1993 levels ranged from 0.16 foot lower (Lake Superior) to 1.76 feet higher (Lake Ontario), than those for July 1992.

Utah's Great Salt Lake level (graph on page 18) fell 0.10 foot through midmonth, then fell another 0.30 foot through monthend, ending the month at 4,201.50 feet above National Geodetic Vertical Datum. Lake level was 0.60 foot lower than at the end of July 1992, and 10.35 feet lower than the maximum of record which occurred in June 1986 and March-April 1987.

Maps on page 19 show streamflow conditions during July 1993 and July 1992. There are only small differences in the percent of area in each flow range for the two months, but the maps look quite different. Below-normal range streamflow occurred during both months in parts of Alaska, Oregon, Washington, British Columbia, Alberta, New York, New Jersey, Virginia, South Carolina, Georgia, New Mexico, Arizona, and Puerto Rico. Above-normal range streamflow occurred during both months in parts of Hawaii, California, Wyoming, Colorado, the Dakotas, Nebraska, Kansas, Oklahoma, Texas, Minnesota, Iowa, Missouri, Wisconsin, Michigan, Illinois, Indiana, and Ohio. Both maps also show reservoir storage near the end of the month at all reporting index reservoir stations for comparison with streamflow.

Graphs for 12 hydrologic areas (page 20) compare monthly streamflow for the 1993 and 1993 water years with median monthly streamflow for 1961-90 and show (page 21) monthly percent departure of streamflow from median for the 1988-93 water years. Streamflow increased from that for June in the Hudson Bay, Florida and Gulf of Mexico, Upper Mississippi River, Missouri River, Ohio River, and Southern Great Plains and Rio Grande basins, and decreased in the other basins (including the Pacific Slope, adjusting for the missing data in June). Streamflow was below median in the Atlantic Slope and Pacific Slope basins, and above median in the other 10 basins.

Provisional data; subject to revision

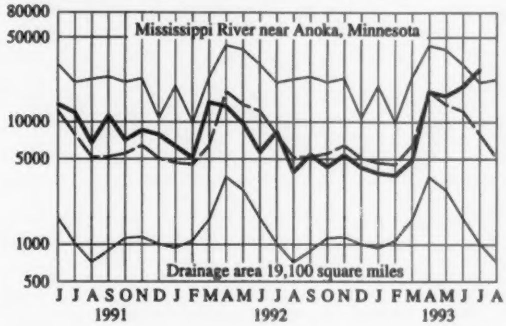
NEW MAXIMUMS DURING JULY 1993 AT STREAMFLOW INDEX STATIONS

			Previous July maximums (period of record)			July 1993			
Station number	Stream and place of determination	Drainage area (square miles)	Years of record	Monthly mean in cfs (year)	Daily mean in cfs (year)	Monthly mean in cfs	Percent of median	Daily mean in cfs	Day
03380500	Skillet Fork at Wayne City, Illinois	464	75	1,056 (1969)	4,900 (1942)	1,285	1,415	4,000	20
04084500	Fox River at Rapide Croche Dam near Wrightstown, Wisconsin	6,010	96	11,150 (1969)	16,200 (1969)	15,600	693	18,700	8
05280000	Crow River at Rockford, Minnesota	2,520	67	4,359 (1957)	9,180 (1957)	6,688	809	9,500	8
05288500	Mississippi River near Anoka, Minnesota	19,100	61	21,120 (1952)	44,500 (1972)	27,250	343	34,400	11
05330000	Minnesota River near Jordan, Minnesota	16,200	58	15,250 (1984)	37,200 (1984)	37,430	806	54,700	1
05331000	Mississippi River at St. Paul, Minnesota	36,800	100	43,290 (1905)	74,300 (1957)	68,070	467	91,000	1
05435500	Pecatonica River at Freeport, Illinois	1,326	78	3,349 (1969)	10,800 (1969)	[1]6,440	955	12,100	11
05446500	Rock River near Joslin, Illinois	9,549	53	15,420 (1978)	32,900 (1978)	24,220	622	32,600	4
05464500	Cedar River at Cedar Rapids, Iowa	6,510	90	27,190 (1969)	52,400 (1969)	[1]37,980	893	60,800	12
05474500	Mississippi River at Keokuk, Iowa	119,000	114	179,400 (1892)	299,000 (1892)	[1]395,500	605	[1]464,000	10
05480500	Des Moines River at Fort Dodge, Iowa	4,190	60	8,883 (1969)	19,300 (1983)	[1]21,530	1,586	30,200	14
05572000	Sangamon River at Monticello, Illinois	550	82	1,520 (1981)	8,720 (1909)	1,787	1,138	5,920	4
06485500	Big Sioux River at Akron, Iowa	8,424	64	4,703 (1983)	11,700 (1983)	18,300	2,298	46,000	13
06800500	Elkhorn River at Waterloo, Nebraska	6,900	72	5,905 (1915)	19,200 (1915)	11,470	1,197	29,300	11
06810000	Nishnabotna River above Hamburg, Iowa	2,806	65	4,756 (1958)	28,700 (1990)	[1]18,150	1,743	36,500	25
06867000	Saline River near Russell, Kansas	1,502	41	1,408 (1951)	6,950 (1950)	[1]3,790	12,265	[1]23,900	22
06884400	Little Blue River near Barnes, Kansas	3,324	34	7,146 (1951)	37,900 (1992)	[1]12,950	2,983	22,300	28
06897500	Grand River near Gallatin, Missouri	2,250	71	7,499 (1958)	50,800 (1922)	[1]29,620	5,609	[1]79,800	7
07146500	Arkansas River at Arkansas City, Kansas	43,713	75	17,190 (1951)	43,000 (1951)	17,600	1,281	44,800	16

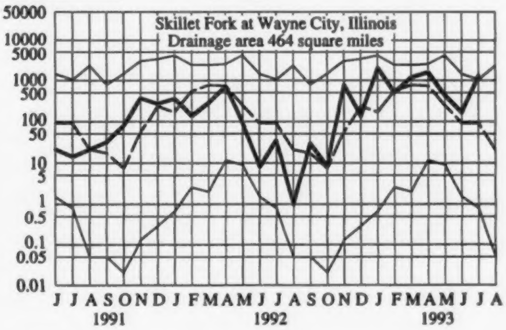
[1]All-time high

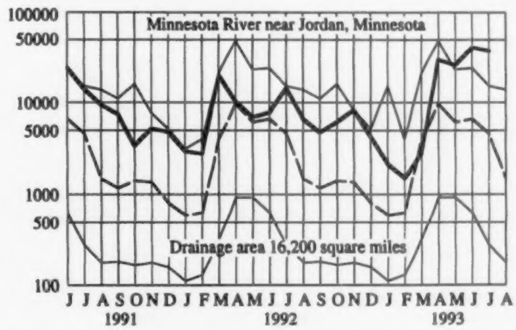
MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

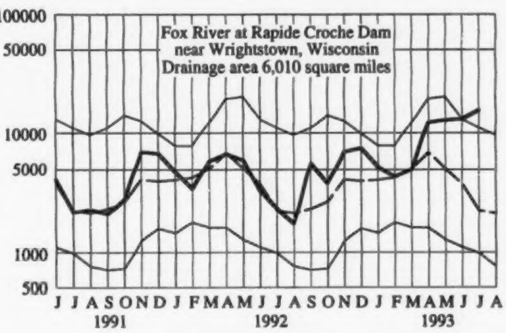
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period 1961-90. Heavy line indicates mean for current period.

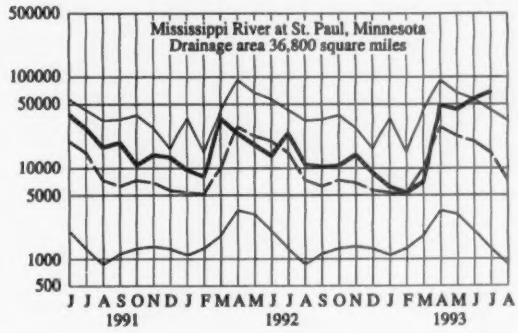


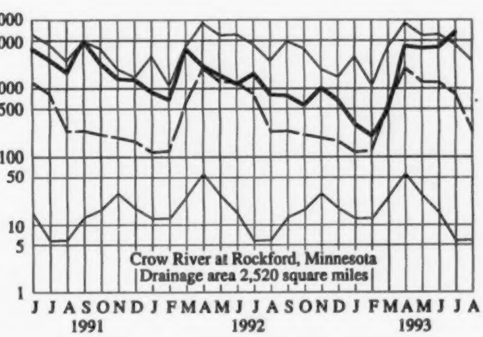
DISCHARGE, IN CUBIC FEET PER SECOND

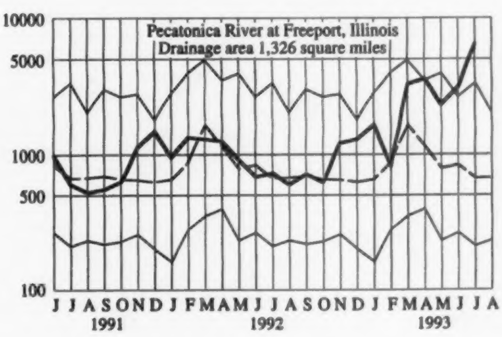












MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

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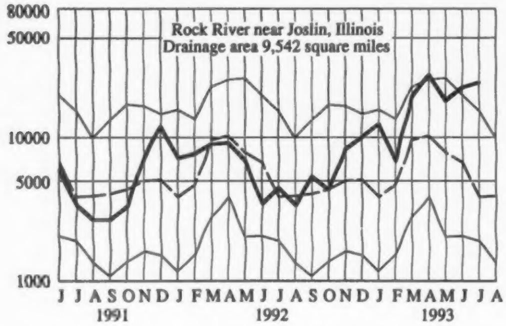
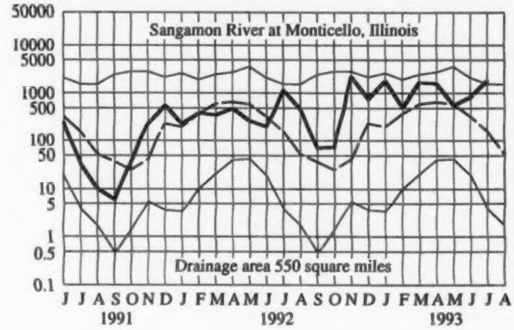
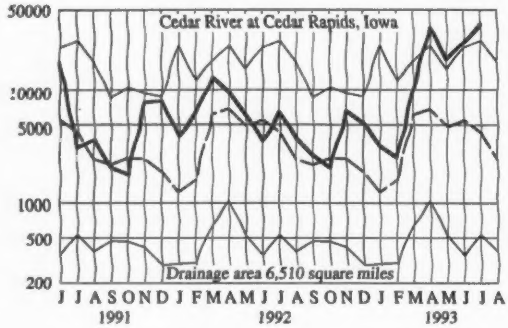
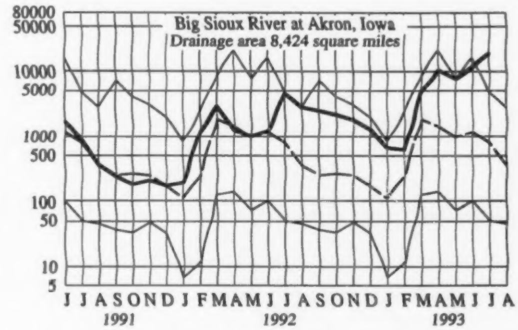
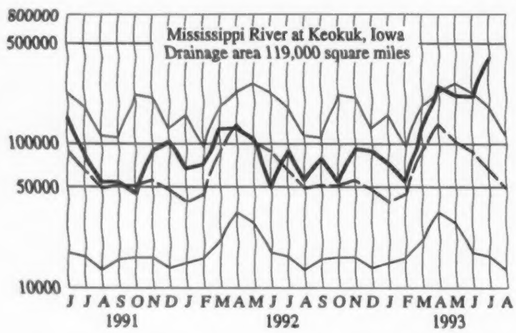
DISCHARGE, IN CUBIC FEET PER SECOND

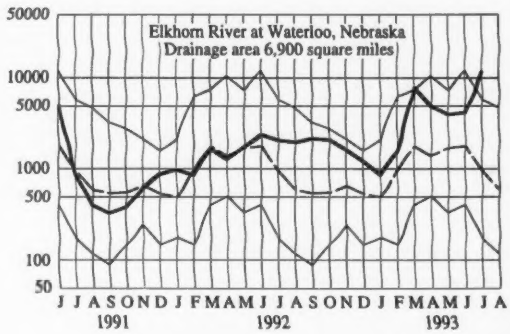


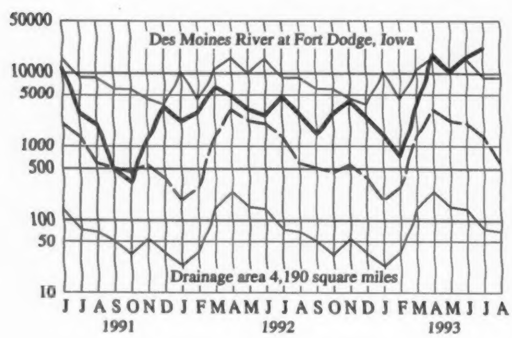


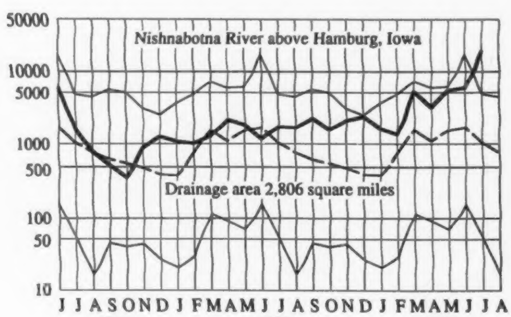






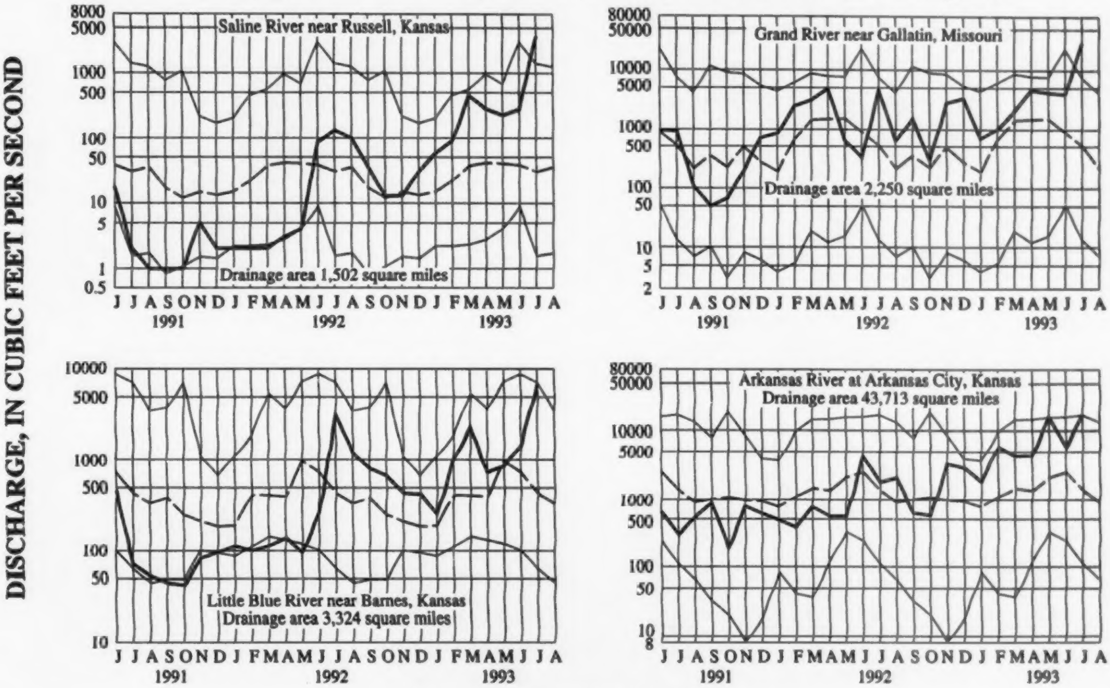






MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period 1961-90. Heavy line indicates mean for current period.



JULY WEATHER SUMMARY

(Adapted from *Weekly Weather and Crop Bulletin*, NOAA/USDA Joint Agricultural Weather Facility)

Catastrophic flooding struck the upper half of the Mississippi Valley and the lower Missouri basin, and dozens of monthly temperature and rainfall records were broken in opposite quadrants of the Nation due to the sheer persistence and strength of a trough-ridge couplet. The energetic trough—fueled by a strong north Pacific jet stream and infused with abundant subtropical moisture—brought record cold to the Northwest and delivered record rainfall to many areas within the Missouri and middle Mississippi River watersheds. Equally anomalous and unyielding was the ridge over the Southeastern States, which suppressed thunderstorm activity and induced a month-long heatwave.

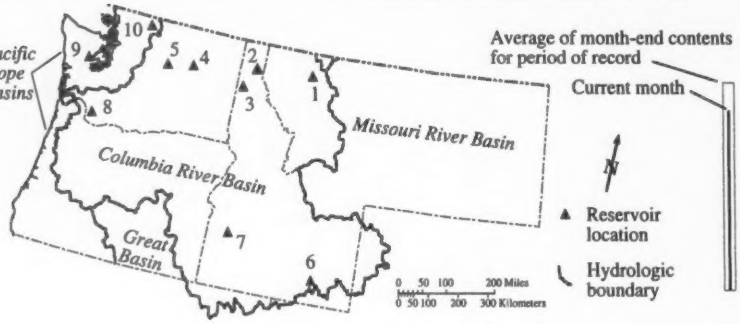
Although similar weather patterns have been observed during portions of other growing seasons (for example, early-summer 1947), never before this century has such a powerful, stubborn trough-ridge couplet dominated throughout June and July. In the Southeast, several locations notched 90 °F readings on every day in July, including Chattanooga, TN, and Atlanta, GA. Montgomery, AL, endured an average July maximum temperature of 97 °F. Atlanta reached the 100 °F mark on seven occasions, while Columbia, SC, remarkably attained that level 17 times during the month. Record July heat was registered as far north as the Middle Atlantic cities of Richmond, VA, Washington, DC, and Philadelphia, PA. Greenville-Spartanburg, SC, suffered through not only its hottest July on record, but its driest (0.75 inches of rain) as well.

Extremely dry weather was noted across much of the Nation's southern tier. Records for July dryness occurred in scattered locations from Arizona to the Carolinas. In parts of central and eastern Texas, including Waco and Dallas-Ft. Worth, no measurable rain fell during the month. But farther north, Concordia, KS, broke its July rainfall record by more than 5 inches, and its 16.75-inch inundation was the station's heaviest one-month total on record. July rainfall records were also established in locations such as Peoria, IL (10.15 inches), Huron, SD (6.69 inches), Bismarck, ND (13.75 inches), Williston, ND (6.28 inches), Miles City, MT (6.34 inches), and Glasgow, MT (5.93 inches).

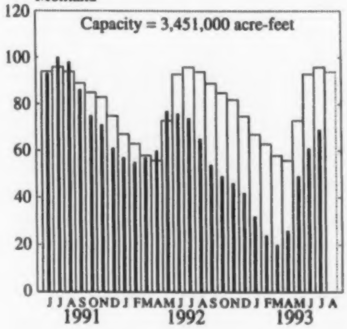
In the Northwest, damp, cool conditions dominated. Spokane, WA, observed a combination of its coldest (8.6 °F below normal) and fifth wettest (2.08 inches of rain) July on record. The gigantic western trough held sway over weather conditions as far south as Salt Lake City, Utah, which had its coldest July ever. The mercury reached 90 °F on only 7 days during the month in Salt Lake City, 16 days fewer than normal.

Toward month's end, a dramatic shift in the weather pattern began to break the Southeast's heatwave and permitted the Nation's mid-section to start drying out. Meanwhile, heat quickly spread into the West. On July 29, Worland, WY, attained 102 °F, a daily record high. During the first 28 days of the month, Worland established 13 daily record lows. Farther east, Bristol, TN, which had its hottest month on record, closed the month with a daily record low of 55 °F.

PACIFIC NORTHWEST (OREGON, WASHINGTON, IDAHO, AND MONTANA) RESERVOIR INDEX STATIONS

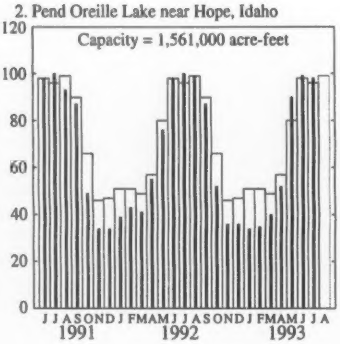


1. Hungry Horse reservoir near Hungry Horse, Montana

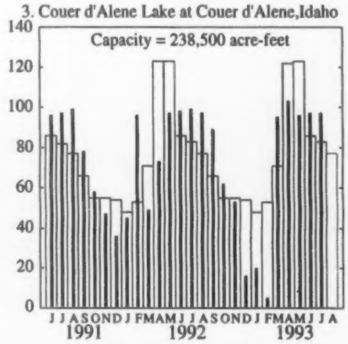


PERCENT OF NORMAL CAPACITY

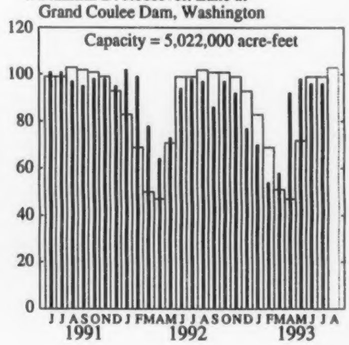
2. Pend Oreille Lake near Hope, Idaho



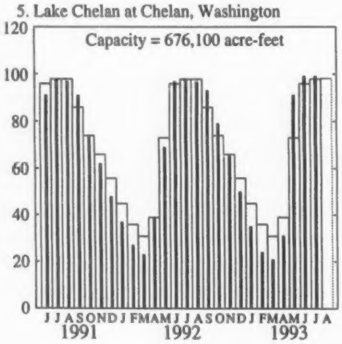
3. Couer d'Alene Lake at Couer d'Alene, Idaho



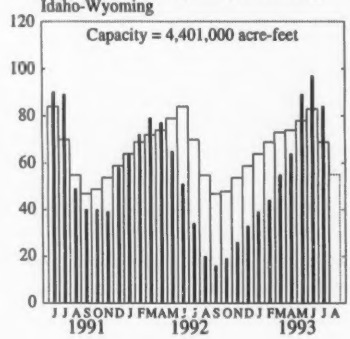
4. Franklin D. Roosevelt Lake at Grand Coulee Dam, Washington



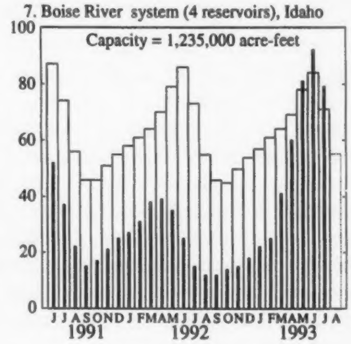
5. Lake Chelan at Chelan, Washington



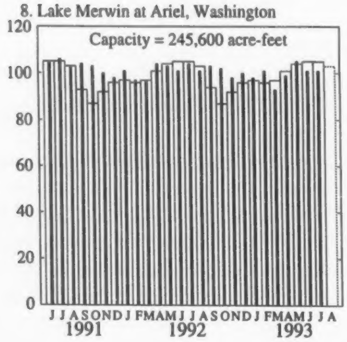
6. Upper Snake River system (8 reservoirs), Idaho-Wyoming



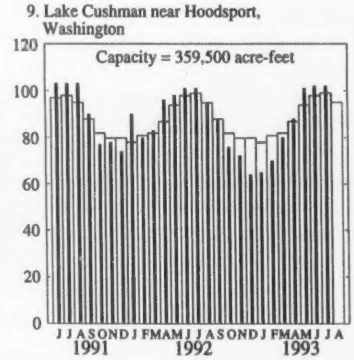
7. Boise River system (4 reservoirs), Idaho



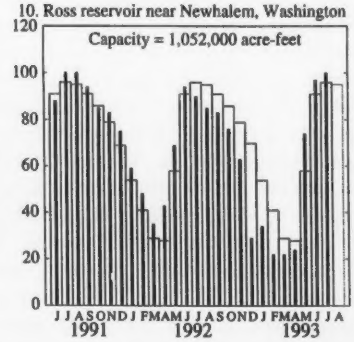
8. Lake Merwin at Ariel, Washington



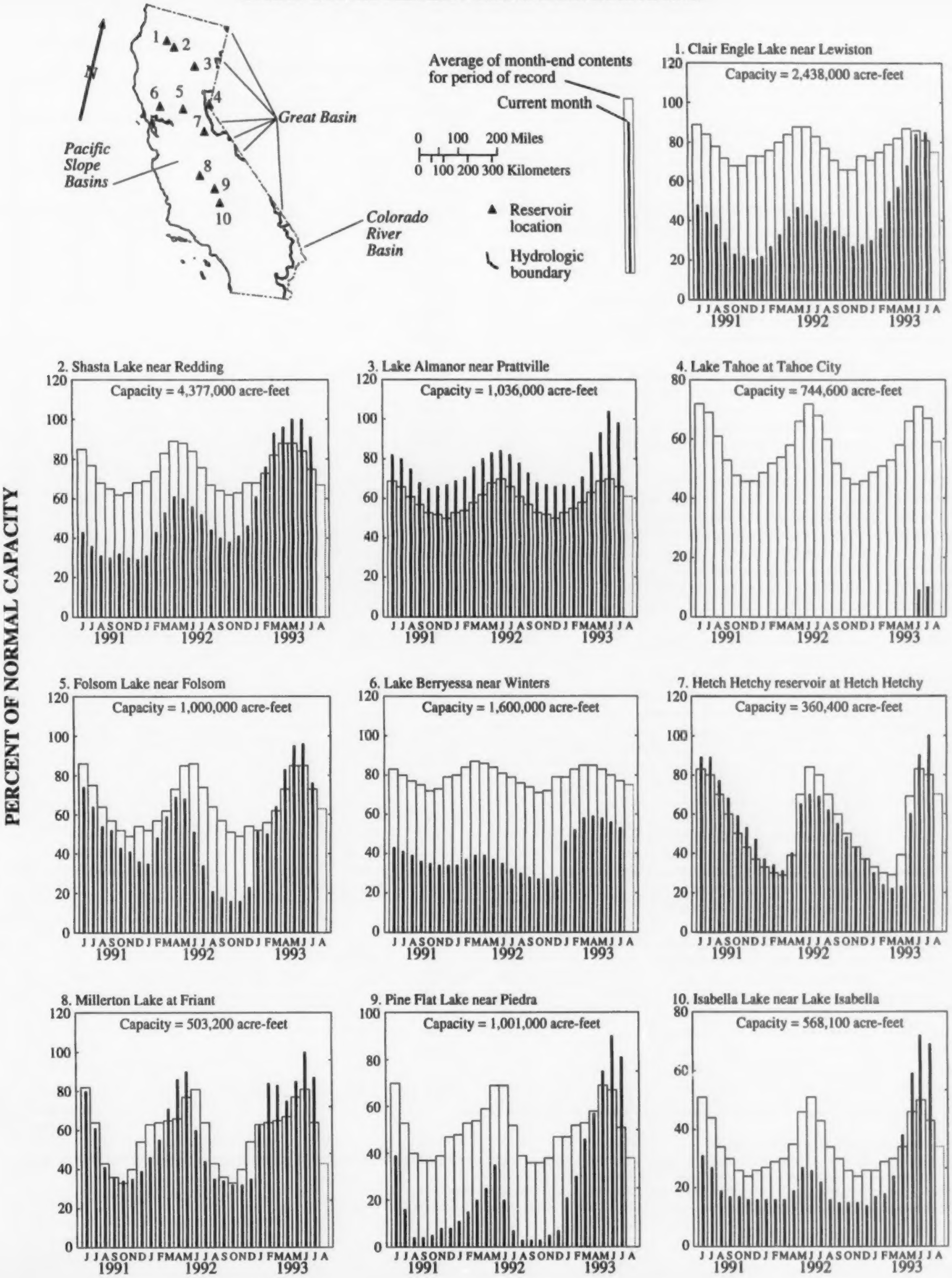
9. Lake Cushman near Hoodsport, Washington



10. Ross reservoir near Newhalem, Washington



CALIFORNIA RESERVOIR INDEX STATIONS



Provisional data; subject to revision

FLOW OF LARGE RIVERS DURING JULY 1993

Station number	Stream and place of determination	Drainage area (square miles)	Average discharge through September 1991 (cubic feet per second)	July 1993: Monthly mean discharge (cubic feet per second)	July 1993: Percent of median monthly discharge 1961–90	July 1993: Change in discharge from previous month (percent)	Discharge near end of month: Cubic feet per second	Discharge near end of month: Million gallons per day	Date
01014000	St. John River below Fish River at Fort Kent, Maine ...	5,665	9,693	3,932	85	–73	2,650	1,710	31
01318500	Hudson River at Hadley, New York	1,664	2,925	† 678	72	–69	540	349	31
01357500	Mohawk River at Cohoes, New York	3,456	5,673	† 1,270	68	–55	1,610	1,040	31
01463500	Delaware River at Trenton, New Jersey	6,780	11,660	† 3,499	65	–24	3,300	2,130	31
01570500	Susquehanna River at Harrisburg, Pennsylvania	24,100	34,200	† 6,344	44	–45	4,610	2,980	31
01646500	Potomac River near Washington, District of Columbia	11,560	[1]11,070	[1]3,050	66	–45	...	...	...
02105500	Cape Fear River at William O. Huske Lock, near Tarheel, North Carolina.	4,852	4,933	...	...	...	...	...	...
02131000	Pee Dee River at Peedee, South Carolina	8,830	9,903	4,000	63	–27	4,820	3,120	31
02226000	Altamaha River at Doctortown, Georgia	13,600	13,570	† 3,629	55	–37	2,530	1,640	31
02320500	Suwannee River at Branford, Florida	7,880	7,038	† 3,070	60	–23	2,980	1,930	31
02358000	Apalachicola River at Chattahoochee, Florida	17,200	22,137	12,100	82	–3	10,000	6,000	31
02467000	Tombigbee River at Demopolis lock and dam, near Coatopa, Alabama.	15,385	23,700	5,187	76	–23	3,450	2,230	31
02489500	Pearl River near Bogalusa, Louisiana	6,573	10,102	9,980	308	88	3,810	2,460	31
03049500	Allegheny River at Natrona, Pennsylvania	11,410	[1]19,690	† [1]3,662	41	–57	3,040	1,960	26
03085000	Monongahela River at Braddock, Pennsylvania	7,337	[1]12,540	† [1]2,225	42	–45	1,650	1,070	26
03193000	Kanawha River at Kanawha Falls, West Virginia	8,367	12,550	† 3,715	65	–43	3,030	1,960	27
03234500	Scioto River at Higby, Ohio	5,131	4,654	* 7,464	374	209	1,220	788	31
03294500	Ohio River at Louisville, Kentucky[2] #	91,170	115,900	61,400	112	–28	41,400	26,800	31
03377500	Wabash River at Mount Carmel, Illinois	28,635	27,880	* 42,360	270	51	25,400	16,400	31
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wisconsin.[2]	6,010	4,248	* 15,600	693	17	11,800	7,640	31
04264331	St. Lawrence River at Cornwall, Ontario, near Massena, New York.[4] #	298,800	245,300	* 318,000	114	–10	310,000	200,000	31
02NG001	St. Maurice River at Grand Mere, Quebec	16,300	[1]24,290	...	...	...	...	...	...
05082500	Red River of the North at Grand Forks, North Dakota	30,100	2,565	* 12,200	417	180	25,500	16,500	31
05133500	Rainy River at Manitou Rapids, Minnesota	19,400	9,036	22,440	132	63	22,800	14,700	31
05330000	Minnesota River near Jordan, Minnesota	16,200	7,062	* 37,430	807	–8	23,400	15,100	31
05331000	Mississippi River at St. Paul, Minnesota#	36,800	[1]15,890	* 68,070	468	19	44,500	28,800	31
05365500	Chippewa River at Chippewa Falls, Wisconsin	5,650	5,072	* 5,060	180	–71	2,200	1,420	31
05407000	Wisconsin River at Muscoda, Wisconsin	10,400	8,666	* 15,570	273	–43	9,690	6,260	31
05446500	Rock River near Joslin, Illinois	9,549	6,161	* 24,220	622	9	16,800	10,900	31
05474500	Mississippi River at Keokuk, Iowa#	119,000	64,070	* 395,500	606	84	309,000	200,000	31
06214500	Yellowstone River at Billings, Montana	11,795	6,965	15,340	104	–34	13,700	8,850	31
06934500	Missouri River at Hermann, Missouri#	524,200	76,940	* 352,000	447	112	725,000	469,000	31
07289000	Mississippi River at Vicksburg, Mississippi[5] #	1,140,500	583,000	* 859,800	195	4	1,030,000	668,000	30
07331000	Washita River near Dickson, Oklahoma	7,202	1,584	* 1,830	412	–64	26	16	...
08276500	Rio Grande below Taos Junction Bridge, near Taos, New Mexico.	9,730	757	727	148	–70	335	216	31
09315000	Green River at Green River, Utah	44,850	6,292	5,204	85	–69	...	...	...
11425500	Sacramento River at Verona, California	21,251	18,810	* 15,680	124	–41	...	...	...
13269000	Snake River at Weiser, Idaho	69,200	18,220	12,000	115	–54	12,600	8,140	31
13317000	Salmon River at White Bird, Idaho	13,550	11,160	13,600	105	–63	9,230	5,960	31
13342500	Clearwater River at Spalding, Idaho	9,570	15,290	12,700	119	–51	7,020	4,540	31
14105700	Columbia River at The Dalles, Oregon[6] #	237,000	[1]192,200	[1]202,800	77	–37	160,000	103,000	31
14191000	Willamette River at Salem, Oregon	7,280	[1]23,400	* [1]8,240	131	–71	9,210	5,950	31
15515500	Tanana River at Nenana, Alaska	25,600	24,200	62,600	104	+28	64,000	41,400	31
08MF005	Fraser River at Hope, British Columbia	83,800	95,720	† 129,600	70	...	...	...	...

# Indicates stations excluded from the combination bar/line graph. See Explanation of Data.

[1] Adjusted.

[2] Records furnished by Corps of Engineers.

[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y., when adjusted for storage in Lake St. Lawrence.

[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.

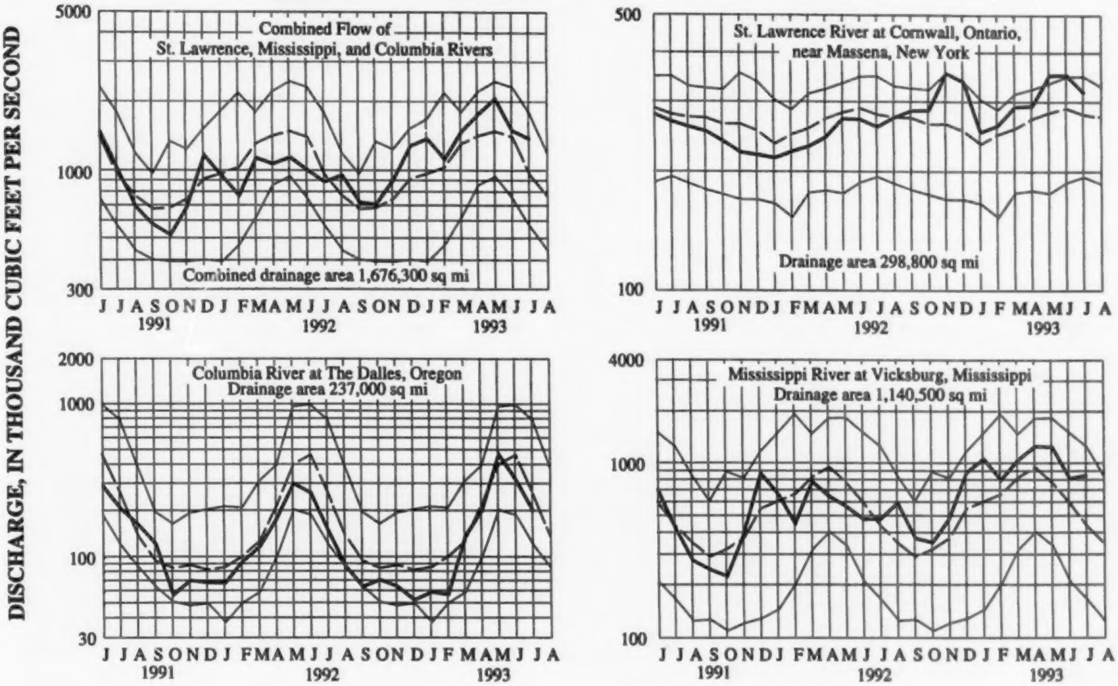
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

* Above–normal range

† Below–normal range

HYDROGRAPHS FOR THE "BIG THREE" RIVERS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period 1961-90. Heavy line indicates mean for current period.



Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES FOR JULY 1993 AT DOWNSTREAM SITES ON FOUR LARGE RIVERS

Station number	Station name	July data of following calendar years	Stream discharge during month Mean (ft^3/s)	Dissolved-solids concentration [1] Minimum (mg/L)	Dissolved-solids concentration [1] Maximum (mg/L)	Dissolved-solids discharge [1] Mean (tons per day)	Dissolved-solids discharge [1] Minimum (tons per day)	Dissolved-solids discharge [1] Maximum (tons per day)	Water temperature [2] Mean (°C)	Water temperature [2] Minimum (°C)	Water temperature [2] Maximum (°C)
01463500	Delaware River at Trenton, New Jersey, (Morrisville, Pennsylvania)	1993	3,500	117	142	1,195	965	1,474	28.0	25.0	31.0
		1945-92	6,690	57	145	[3]2,066	465	16,700	[3]25.5	18.5	33.5
		(Extreme yr)		(1947)	(1978)		(1965)	(1969)			
			[4]5,394								
07289000	Mississippi River at Vicksburg, Mississippi	1993	859,800	210	267	545,000	485,600	643,800	28.0	27.5	30.0
		1976-92	498,300	188	330	309,500	114,000	633,000	25.5	23.5	34.5
		(Extreme yr)		(1989)	(1988)		(1988)	(1980)			
			[4]441,800								
06934500	Missouri River at Hermann, Missouri. (60 miles west of St. Louis, Missouri)	1993	352,000	175	318	202,900	80,300	452,000	27.5	26.0	30.0
		1976-92	93,210	201	501	88,550	44,700	208,000	27.5	22.0	32.5
		(Extreme yr)		(1981)	(1985)		(1977)	(1984)			
			[4]78,820								
14246900	Columbia River at Beaver Army Terminal, near Quincy, Oregon (streamflow station at The Dalles, Oregon)	1993	198,000	74	88	42,800	36,100	48,300	19.0	17.5	21.5
		1976-92	158,900	60	158	32,200	12,500	65,100	17.5	15.5	22.0
		(Extreme yr)		(1976)	(1992)		(1977)	(1981)			
			[4,5]262,400								

[1]Dissolved-solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.

[2]To convert °C to °F: [(1.8 x °C) + 32] = °F.

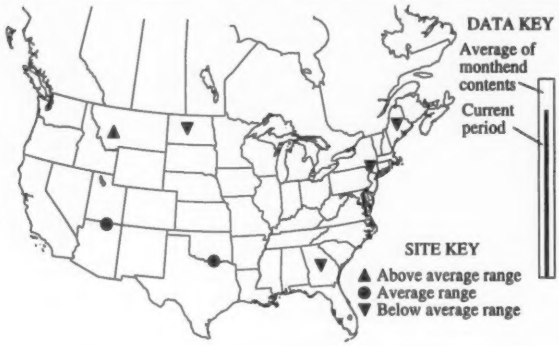
[3]Mean for 8-year period (1983-91).

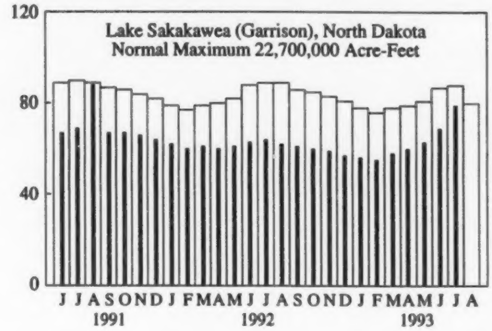
[4]Median of monthly values for 30-year reference period, water years 1961-90, for comparison with data for current month.

[5]Adjusted

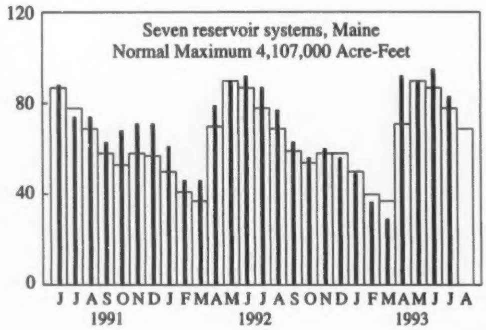
USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF JULY 1993

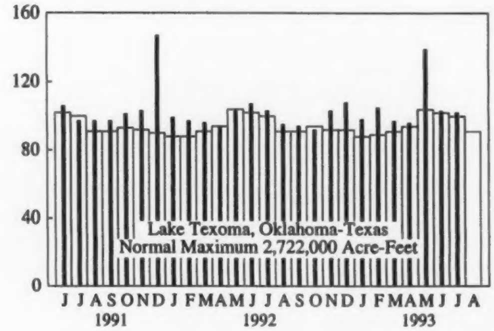
[Contents are expressed in percent of reservoir (system) capacity. The usable capacity of each reservoir (system) is shown in the column headed "Normal maximum" in the table Usable contents of selected reservoir systems.]

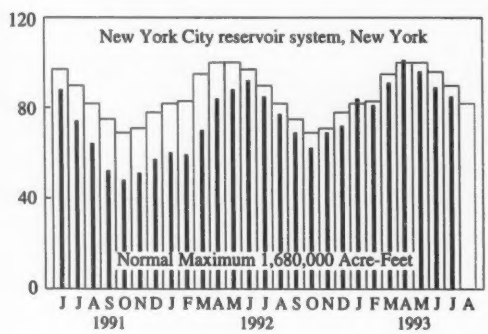


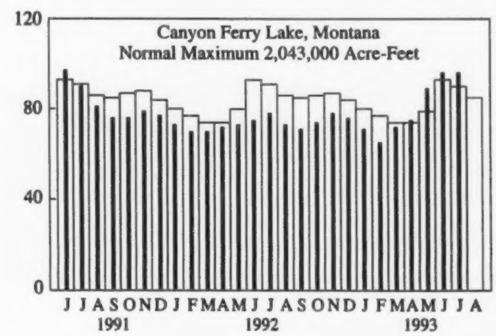


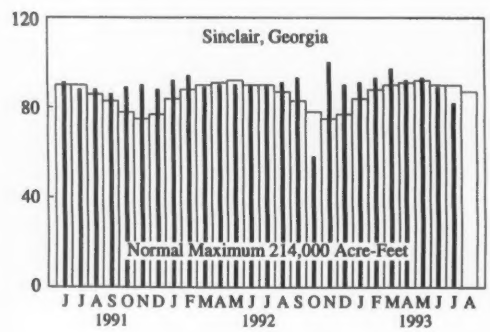
PERCENT OF NORMAL MAXIMUM

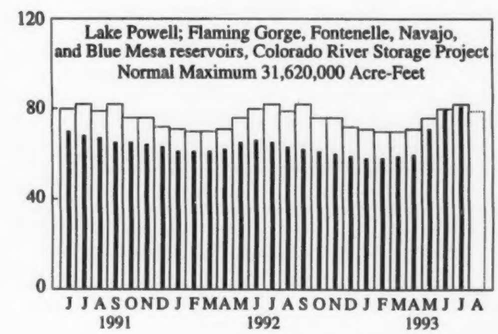












Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS NEAR END OF JULY 1993

[Contents are expressed in percent of reservoir or reservoir system capacity. The usable capacity of reservoir or reservoir system is shown in the column headed "Normal maximum"]

Reservoir or reservoir system Principal uses: F-Flood control I-Irrigation M-Municipal P-Power R-Recreation W-Industrial	Percent of normal maximum: End of July 1993	End of July 1992	Average for end of July	End of June 1993	Normal maximum (acre-feet)[1]
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook reservoirs (P)	64	41	60	64	[2]226,300
QUEBEC					
Allard (P)	* 84	77	76	88	280,600
Gouin (P)	* 78	71	69	78	6,954,000
MAINE					
Seven reservoir systems (MP)	† 83	87	92	95	4,107,000
NEW HAMPSHIRE					
First Connecticut Lake (P)	85	87	88	92	76,450
Lake Francis (FPR)	89	84	86	94	99,310
Lake Winnipesaukee (PR)	† 76	91	88	84	165,700
VERMONT					
Harriman (P)	78	79	78	83	116,200
Somerset (P)	83	85	82	85	57,390
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	† 77	95	83	83	77,920
NEW YORK					
Great Sacandaga Lake (FPR)	83	90	83	98	786,700
Indian Lake (FMP)	90	96	91	98	103,300
New York City reservoir system (MW)	† 77	85	91	89	1,680,000
NEW JERSEY					
Wanaque (M)	† 66	82	82	88	85,100
PENNSYLVANIA					
Allegheny (FPR)	44	50	46	49	1,180,000
Pymatuning (FMR)	93	100	93	98	188,000
Raystown Lake (FR)	67	68	64	68	761,900
Lake Wallenpaupack (PR)	† 67	71	73	80	157,800
MARYLAND					
Baltimore Municipal System (M)	* 98	76	90	100	261,900
NORTH CAROLINA					
Bridgewater (Lake James) (P)	95	96	90	94	288,800
Narrows (Badin Lake) (P)	92	93	96	93	128,900
High Rock Lake (P)	82	89	78	89	234,800
SOUTH CAROLINA					
Lake Murray (P)	* 85	90	79	91	1,614,000
Lake Marion and Lake Moultrie (P)	* 84	79	72	84	1,777,000
SOUTH CAROLINA-GEORGIA					
Strom Thurmond Lake (FP)	68	71	69	73	1,730,000
GEORGIA					
Burton Lake (PR)	92	97	92	97	104,000
Sinclair (MPR)	† 82	90	90	89	214,000
Lake Sidney Lanier (FMPR)	55	60	60	62	1,686,000
ALABAMA					
Lake Martin (P)	95	97	91	99	1,375,000
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	* 63	66	57	70	2,293,000
Douglas Lake (FPR)	* 71	77	62	78	1,395,000
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	81	86	77	88	1,012,000
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	* 72	76	63	82	2,880,000
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	* 85	88	76	91	1,478,000
WISCONSIN					
Chippewa and Flambeau (PR)	88	90	83	95	365,000
Wisconsin River (21 reservoirs) (PR)	* 84	72	74	92	399,000
MINNESOTA					
Mississippi River Headwater System (FMR)	* 52	41	38	48	1,640,000
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	† 79	64	88	69	22,700,000
SOUTH DAKOTA					
Angostura (I)	* 91	71	81	92	130,770
Belle Fourche (I)	* 82	26	54	77	185,200
Lake Francis Case (FIP)	* 90	81	84	83	4,589,000
Lake Oahe (FIP)	* 85	64	74	77	22,240,000
Lake Sharpe (FIP)	102	99	101	101	1,697,000
Lewis and Clark Lake (FIP)	† 92	84	100	88	432,000
NEBRASKA					
Lake McConaughy (IP)	† 65	54	74	68	1,948,000
OKLAHOMA					
Eufaula Lake (FPR)	* 103	109	91	110	2,378,000
Keystone Lake (FPR)	* 134	106	93	127	661,000
Tenkiller Ferry Lake (FPR)	* 110	109	98	117	628,200
Lake Altus (FIMR)	* 88	94	67	100	133,000
Lake O'The Cherokees (FPR)	* 101	106	92	107	1,492,000
OKLAHOMA-TEXAS					
Lake Texoma (FMPRW)	102	103	100	103	2,722,000
TEXAS					
Bridgeport (IMW)	* 95	96	57	98	386,400
Canyon Lake (FMR)	* 98	100	84	99	385,600
International Amistad (FIMPW)	* 87	98	77	87	3,497,000
International Falcon (FIMPW)	* 74	103	66	71	2,668,000
Livingston (IMW)	* 101	99	91	106	1,788,000
Possum Kingdom Lake (IMPRW)	† 86	96	96	93	570,200
Red Bluff (P)	* 37	49	26	40	307,000
Toledo Bend (P)	92	95	90	103	4,472,000
Twin Buttes (FIM)	* 64	81	34	72	177,800
Lake Kemp (IMW)	92	93	89	99	268,000
Lake Meredith (FMW)	37	44	38	38	796,900
Lake Travis (FIMPRW)	* 91	99	79	98	1,144,000
MONTANA					
Canyon Ferry Lake (FIMPR)	* 96	78	90	96	2,043,000
Fort Peck Lake (FPR)	† 68	58	88	62	18,910,000
Hungry Horse (FIPR)	† 69	74	96	61	3,451,000
WASHINGTON					
Ross (PR)	100	90	96	97	1,052,000
Franklin D. Roosevelt Lake (IP)	96	98	99	96	5,022,000
Lake Chelan (PR)	99	98	98	99	676,100
Lake Cushman (PR)	102	101	99	102	359,500
Lake Merwin (P)	101	104	105	101	245,600
IDAHO					
Boise River (4 Reservoirs) (FIP)	* 79	15	71	92	1,235,000
Coeur d'Alene Lake (P)	* 97	99	83	97	238,500
Pend Oreille Lake (FP)	98	100	96	99	1,561,000
IDAHO-WYOMING					
Upper Snake River (8 Reservoirs) (MP)	* 84	34	69	97	4,401,000
WYOMING					
Boysen (FIP)	* 97	78	88	100	802,000
Buffalo Bill (IP)	* 124	98	99	116	421,300
Keyhole (F)	† 36	13	45	35	193,800
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey reservoirs (I)	† 51	37	60	58	3,056,000
COLORADO					
John Martin (FIR)	17	5	22	25	364,400
Taylor Park (IR)	90	83	91	84	106,200
Colorado-Big Thompson Project (I)	* 81	69	72	82	730,300
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa reservoirs (IFPR)	81	65	82	80	31,620,000
UTAH-IDAHO					
Bear Lake (IPR)	† 38	23	67	38	1,421,000
CALIFORNIA					
Folsom Lake (FIMPR)	76	34	73	96	1,000,000
Hetch Hetchy (MP)	* 100	69	80	90	360,400
Lake Isabella (FIR)	* 69	22	43	72	568,100
Pine Flat Lake (FIR)	* 81	7	51	90	1,001,000
Clair Engle Lake (Lewiston) (FP)	85	40	81	84	2,438,000
Lake Almanor (P)	* 98	82	66	104	1,036,000
Lake Berryessa (FIMRW)	† 53	32	77	56	1,600,000
Millerton Lake (FI)	* 87	44	64	100	503,200
Shasta Lake (FIPR)	* 91	52	75	100	4,377,000
CALIFORNIA-NEVADA					
Lake Tahoe (IMPRW)	† 10	0	67	9	744,600
NEVADA					
Rye Patch (I)	† 27	0	59	30	194,300
ARIZONA-NEVADA					
Lake Mead and Lake Mohave (FIMP)	81	75	76	82	27,970,000
ARIZONA					
San Carlos (IP)	* 61	64	23	69	935,100
Salt and Verde River System (IMPR)	* 71	75	47	77	2,019,100
NEW MEXICO					
Conchas (FIR)	83	92	83	85	315,700
Elephant Butte and Caballo (FIPR)	* 88	88	40	91	2,394,000

[1] 1 acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second per day.

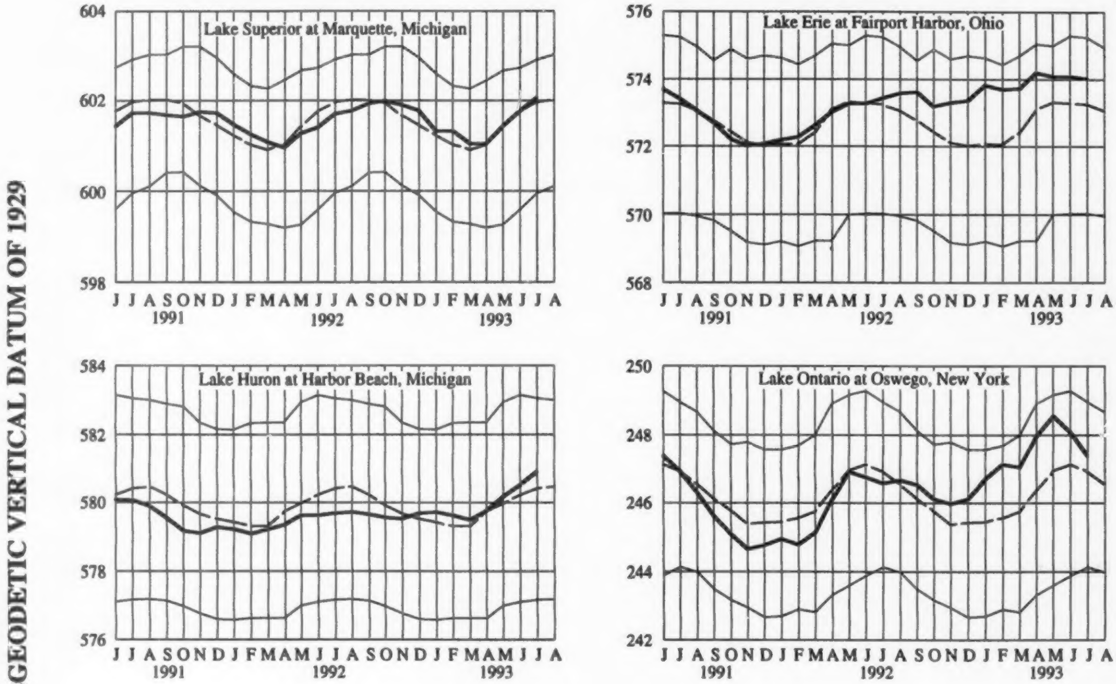
[2] Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

* Above-average range

† Below-average range

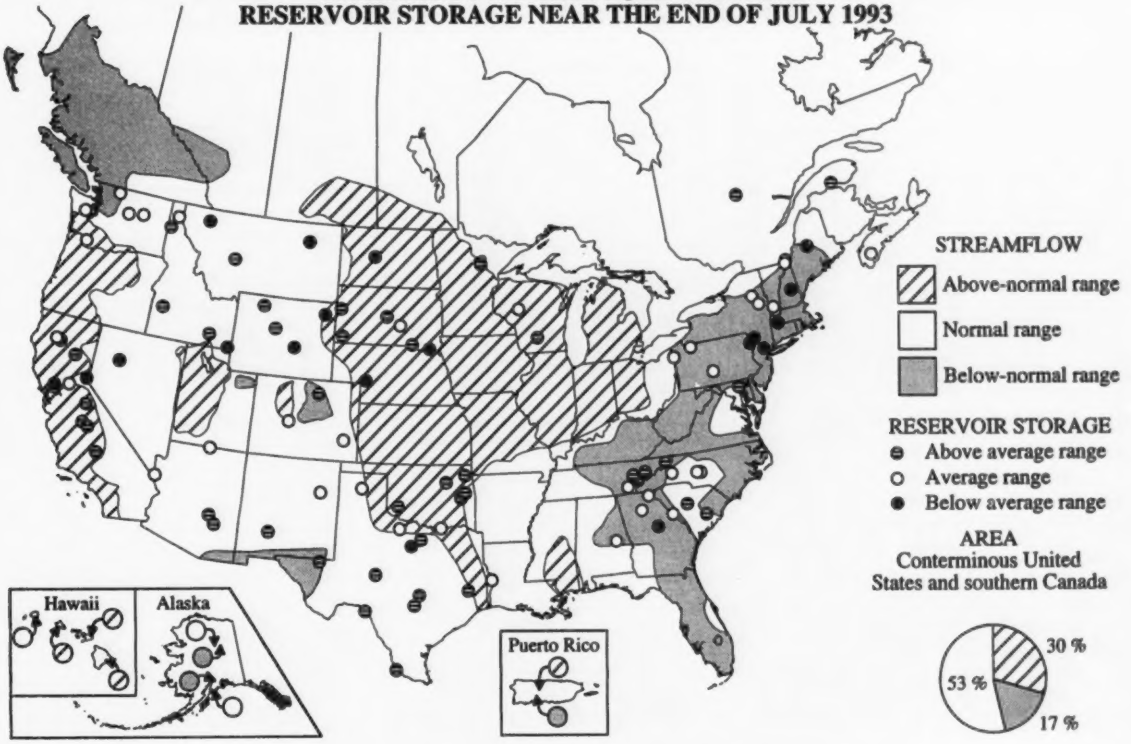
GREAT LAKES ELEVATIONS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period 1961-90. Heavy line indicates mean for current period. Data from National Ocean Service.

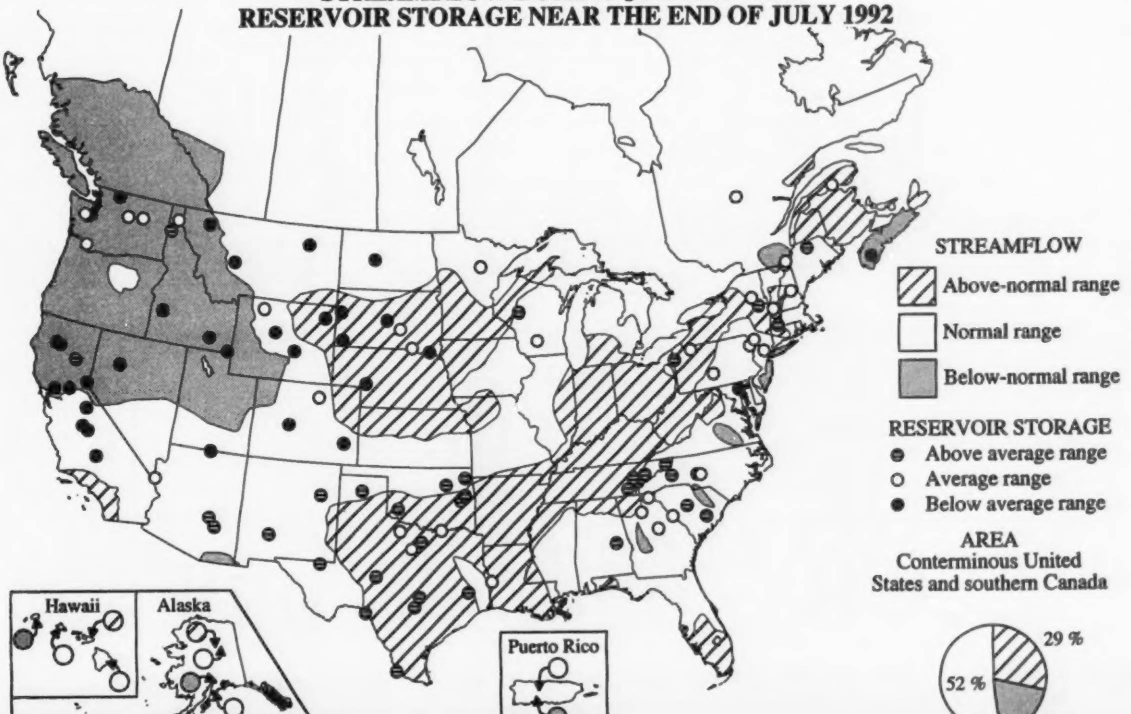


FLUCTUATIONS OF THE GREAT SALT LAKE, OCTOBER 1987 THROUGH JULY 1993

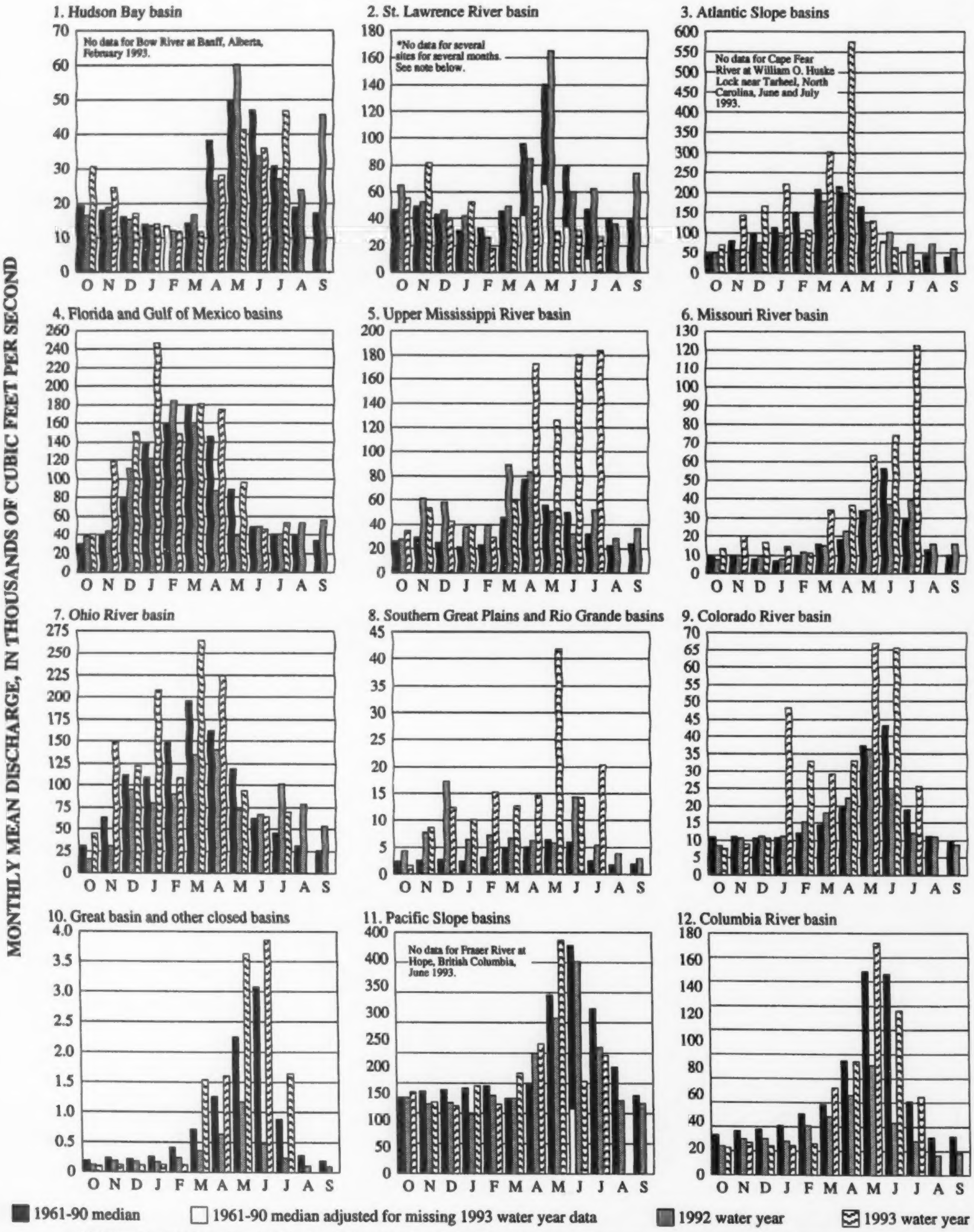
STREAMFLOW DURING JULY 1993 AND RESERVOIR STORAGE NEAR THE END OF JULY 1993



STREAMFLOW DURING JULY 1992 AND RESERVOIR STORAGE NEAR THE END OF JULY 1992

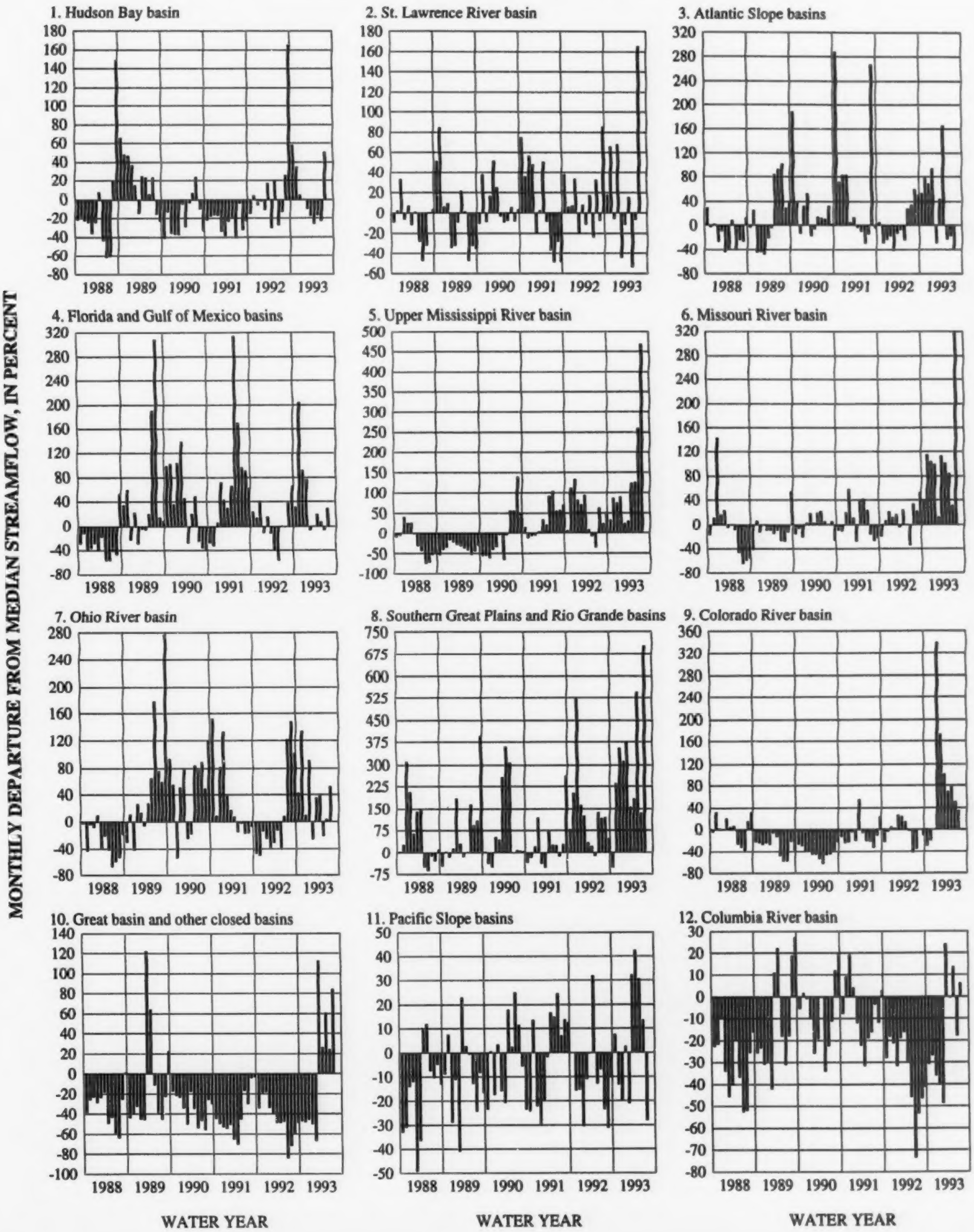


ACTUAL MONTHLY STREAMFLOW, 1992 AND 1993 WATER YEARS, COMPARED WITH MEDIAN MONTHLY STREAMFLOW, 1961-90

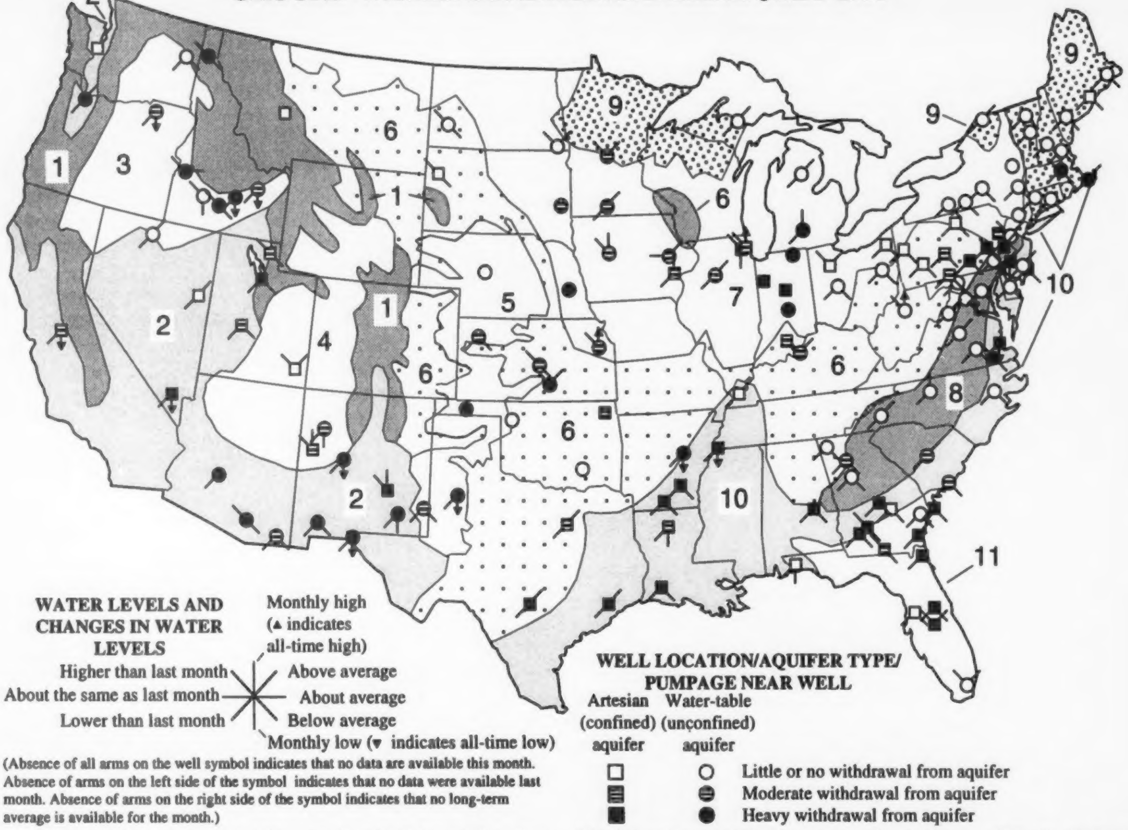


*No data for St. Francois River at Hemmings Falls, Outardes River (adjusted) at Outardes Falls, and St. Maurice River (adjusted) at Grand Mere, Quebec, April-July 1993. No data for Coulonge River near Fort Coulonge, Quebec, July 1993.

MONTHLY DEPARTURE OF ACTUAL STREAMFLOW (OCTOBER 1987-JULY 1993) FROM MEDIAN STREAMFLOW (1961-90)



GROUND-WATER CONDITIONS DURING JULY 1993



New extremes occurred at 33 ground-water index stations (see table on page 24) during July—28 low (including 10 all-time, counting the equalling of an all-time low set in June) and 5 highs—compared with 28 new extremes last month. Graphs showing water levels in seven wells for the past 26 months are on page 25. Two of the graphs are for wells in the Glaciated Central region (monthly highs in Iowa and Michigan). The other graphs are for wells in the Alluvial Basins region (New Mexico), the Columbia Lava Plateau region (a monthly low in Idaho), the Piedmont and Blue Ridge region (Virginia), the Northeast and Superior Uplands region (Massachusetts), and the Southeast Coastal Plain region (Florida).

Ground-water levels in the Western Mountain Ranges region were below last month's except in Washington, and below long-term average throughout the Region. An all-time low (the fourth in the last five months) occurred in the Cretaceous aquifer well near Helena, Montana.

In the Alluvial Basins region, ground-water levels were generally below last month's levels in California, Oregon, Nevada, and Texas; and were mixed with respect to last month's in Arizona, New Mexico, and Utah. Levels were below long-term averages except in the Oregon well, two wells in Nevada, and one well in New Mexico, which were above average. All-time lows occurred in the valley-fill aquifer well near Las Vegas, Nevada (for the second consecutive month); in the Mehrten aquifer well near Wilton, California (following nine monthly lows); in the basin-fill aquifer at Albuquerque, New Mexico (for the second consecutive month); and in the Hueco Bolson aquifer at El Paso, Texas (for the first time this year). A July high occurred in the Roswell Basin aquifer well at Roswell, New Mexico and a monthly low occurred in the Roswell Basin shallow aquifer well at Dayton, New Mexico (for the third consecutive month).

In the Columbia Lava Plateau region, water levels were below last month's in Oregon and mixed with respect to last month's levels in Idaho. Water levels were below long-term averages throughout the Region. All-time lows occurred in the Snake River Plain aquifer wells near Atomic City, Idaho (for the seventh consecutive month) and near Rupert, Idaho (for the second consecutive month following eight monthly lows); and in the Columbia River basalts aquifer well at Pendleton, Oregon (for the first time this year). A monthly low occurred in the Snake River Plain aquifer well at Gooding, Idaho (for the tenth consecutive month).

Levels in the Colorado Plateau and Wyoming Basin region were above last month's levels in Utah and mixed with respect to last month's levels in New Mexico. Levels were above long-term average in Utah and mixed with respect to average in New Mexico. A monthly low occurred in the Westwater Canyon aquifer well near Grants-Bluewater, New Mexico (for the seventh consecutive month and a monthly high occurred in the San Andres-Yeso aquifer well at Bluewater, New Mexico (for the second consecutive month).

In the High Plains region, ground-water levels were below last month's levels in Nebraska, Oklahoma, and Texas, and about the same as last month's levels in New Mexico. Levels were below long-term averages except in Nebraska. An all-time low occurred in the Ogallala aquifer well near Lubbock, Texas (for the sixth consecutive month and the ninth time this year). A September low occurred in the Ogallala aquifer well near Colby, Kansas.

Provisional data; subject to revision

WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES–JULY 1993

GROUND–WATER REGION Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well in feet	Water level in feet below land–surface datum	Departure from average in feet	Net change in water level in feet since: Last month	Last year	Year records began	Remarks
WESTERN MOUNTAIN RANGES (1)								
Rathdrum Prairie aquifer near Athol, northern Idaho	●	485	466.2	–6.4	0.9	–2.8	1929	
ALLUVIAL BASINS (2)								
Alluvial valley–fill aquifer in Steptoe Valley, Nevada	□	122	9.66	2.78	–.73	–.38	1949	
Valley–fill aquifer, Elfrida area near Douglas, Arizona	⊜	124	100.45	–15.15	–.14	.77	1947	
Hueco bolson aquifer at El Paso, Texas	●	640	274.48	–18.72	–.25	–1.70	1964	All–time low
COLUMBIA LAVA PLATEAU (3)								
Snake River Plain aquifer near Eden, Idaho	●	208	124.0	–5.6	4.1	–.7	1962	
Columbia River basalts aquifer at Pendleton, Oregon	⊜	1,501	228.30	–34.39	–.85	–.04	1965	All–time low
COLORADO PLATEAU AND WYOMING BASIN (4)								
Dakota aquifer near Blanding, Utah	□	140	43.01	2.68	1.13	5.27	1960	
HIGH PLAINS (5)								
Ogallala aquifer near Colby, Kansas	⊜	175	131.10	–11.43	–.35	.13	1947	
Southern High Plains aquifer at Lovington, New Mexico	⊜	212	58.46	–3.49	–.21	.21	1971	
NONGLACIATED CENTRAL REGION (6)								
Sentinel Butte aquifer near Dickinson, North Dakota	○	160	20.04	–2.39	1.11	2.07	1968	
Sand and gravel Pleistocene aquifer near Valley Center, Kansas	●	54	14.09	2.89	1.83	6.54	1937	
Glacial outwash aquifer near Louisville, Kentucky	⊜	94	18.00	5.89	.15	.20	1945	
Upper Pennsylvanian aquifer in the Central Appalachians Plateau near Glenville, West Virginia	○	25	10.50	6.19	.34	.86	1953	All–time high
GLACIATED CENTRAL REGION (7)								
Fluvial sand and gravel aquifer, Platte River Valley, near Ashland, Nebraska	●	12	...	...	...	...	1933	
Sheyenne Delta aquifer near Wyndmere, North Dakota	○	40	2.52	2.58	.41	3.78	1963	
Pleistocene (glacial drift) aquifer at Princeton, Illinois	⊜	29	6.50	4.40	–.38	–.20	1942	
Shallow drift aquifer near Roscommon, Michigan	○	14	4.33	.32	–.63	–.08	1934	
Silurian–Devonian carbonate aquifer near Dola, Ohio	□	51	6.18	1.07	.26	–.22	1954	
PIEDMONT AND BLUE RIDGE (8)								
Water–table aquifer in Petersburg Granite, southeastern Piedmont at Colonial Heights, Virginia	○	100	15.91	–.29	–.95	–.06	1939	
Weathered granite aquifer near Mocksville, North Carolina	○	31	14.55	3.51	–1.03	1.91	1981	July high
Surficial aquifer at Griffin, Georgia	○	30	16.27	–.69	–1.92	1.08	1943	
NORTHEAST AND SUPERIOR UPLANDS (9)								
Pleistocene glacial outwash aquifer, at Camp Ripley, near Little Falls, Minnesota	⊜	59	13.06	.80	1.31	1.86	1949	
Glacial outwash sand aquifer at Oxford, Maine	○	39	9.00	–.48	–.63	–.60	1980	
Shallow sand aquifer (glacial deposits) at Acton, Massachusetts	●	34	18.98	–.05	–.76	.53	1965	
Stratified drift aquifer near Morristown, Vermont	○	50	20.08	–.54	–1.09	.04	1966	
ATLANTIC AND GULF COASTAL PLAIN (10)								
Columbia deposits aquifer near Camden, Delaware	○	11	6.99	–.48	–.68	1.18	1950	
Memphis sand aquifer near Memphis, Tennessee	■	384	109.14	–17.30	–1.59	–1.54	1940	All–time low
Eutaw aquifer at Montgomery, Alabama	■	270	25.2	–1.9	–.5	–.9	1952	
Evangeline aquifer at Houston, Texas	■	1,152	275.35	25.34	–.13	6.70	1978	
SOUTHEAST COASTAL PLAIN (11)								
Upper Floridan aquifer on Cockspur Island near Savannah, Georgia	■	348	37.16	–7.80	–2.10	–3.26	1956	
Upper Floridan aquifer at Jacksonville, Florida	■	905	–21.0	–5.4	–.2	–.3	1930	
Biscayne aquifer near Homestead, Florida	○	20	6.13	.41	.48	.64	1932	

Ground-water levels in the Nonglaciated Central region were generally below last month's levels except in Oklahoma, where they were mixed with respect to last month's levels, and in Georgia, where they were below last month's levels. Water levels were generally above long-term averages in Oklahoma, Texas Georgia, Kentucky, Maryland, West Virginia, and Pennsylvania, and below average elsewhere. All-time lows occurred in the Sentinel Butte aquifer well near Dickinson, North Dakota (for the 5th consecutive month and the 10th time this year), and the Equus aquifer well near Halstead, Kansas (for the third consecutive month). A September high occurred in the Twin Mountains (Trinity) aquifer well near Hurst/Fort Worth, Texas.

Ground-water levels in the Glaciated Central region were generally below last month's in the Dakotas, Kansas, and Illinois; mixed with respect to last month's levels in Indiana, Ohio, and New York; and generally above last month's levels elsewhere. Water levels were generally below long-term averages only in Illinois and Ohio. An all-time low occurred in the Lower Mount Simon aquifer well at Illinois Beach State Park, Illinois. A September low occurred in the Ironton-Galesville aquifer well at Illinois Beach State Park, Illinois, and a September high occurred in the Silurian-Devonian carbonate aquifer well near Dola, Ohio.

In the Piedmont and Blue Ridge region, ground-water levels were below last month's except in New Jersey where levels were

Provisional data; subject to revision

NEW EXTREMES DURING JULY AT GROUND–WATER INDEX STATIONS

WRD Station Identification Number	GROUND–WATER REGION Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well	End–of–month water level in feet below land surface datum: Years of record	Previous July Record: Average	Previous July Record: Extreme (year)	July 1993
	LOW WATER LEVELS						
	WESTERN MOUNTAIN RANGES (1)						
463906112043901	Cretaceous aquifer near Helena, Montana	□	110	16	30.15	36.25 (1991)	[1]39.25
	ALLUVIAL BASINS (2)						
382444121123301	Mehrten aquifer near Wilton, California	▤	300	6	138.11	142.89 (1992)	[1]143.71
361611115151301	Valley–fill aquifer near Las Vegas, Nevada	■	905	47	39.25	110.72 (1992)	[1]123.84
324340104231701	Roswell Basin shallow aquifer at Dayton, New Mexico	●	250	41	93.46	123.13 (1992)	123.19
351051106395301	Basin–fill aquifer at Albuquerque, New Mexico	●	980	10	35.44	39.16 (1992)	[1]40.24
315212106245101	Hueco bolson aquifer at El Paso, Texas	●	640	28	255.76	272.83 (1991)	[1]274.48
	COLUMBIA LAVA PLATEAU (3)						
453934118491701	Columbia River basalts aquifer at Pendleton, Oregon	⊜	1,501	26	193.91	228.26 (1992)	[1]228.30
432700112470801	Snake River Plain aquifer near Atomic City, Idaho	⊜	636	44	585.2	589.1 (1992)	[1]590.0
425635114382302	Snake River Plain aquifer at Gooding, Idaho	○	165	21	134.5	149.2 (1992)	152.4
424053113412801	Snake River Plain aquifer near Rupert, Idaho	●	194	42	154.4	166.6 (1992)	[1]169.4
	COLORADO PLATEAU AND WYOMING BASIN (4)						
352023107473201	Westwater Canyon aquifer near Grants–Bluewater, New Mexico	⊜	155	37	77.75	80.65 (1991)	81.86
	HIGH PLAINS (5)						
341010102240801	Ogallala aquifer near Lubbock, Texas	●	202	42	56.63	94.20 (1992)	[1]96.33
	GLACIATED CENTRAL REGION (7)						
422803087475302	Lower Mount Simon aquifer at Illinois Beach State Park, Illinois	■	2,264	4	203.28	206.32 (1992)	206.53
	NORTHEAST AND SUPERIOR UPLANDS (9)						
435343072151801	Stratified drift aquifer near West Fairlee Village, Vermont	○	54	26	4.33	5.03 (1985)	5.09
	ATLANTIC AND GULF COASTAL PLAIN (10)						
395524074502501	Upper Potomac-Raritan-Magothy aquifer system near Medford, New Jersey	■	410	16	119.35	143.56 (1988)	144.62
344607091543401	Mississippi Valley alluvial aquifer near Lonoke, Arkansas	●	135	24	111.80	122.12 (1989)	[1]123.64
321357092341701	Sparta aquifer near Ruston, Louisiana	▤	763	49	224.61	237.90 (1992)	239.55
303108087162301	Sand and gravel aquifer at Ensley, Florida	□	239	53	74.26	83.89 (1992)	84.76
372506076511703	Upper Potomac aquifer near Toana, Virginia	■	401	7	159.57	164.10 (1992)	[1]165.01
350900089482300	Memphis sand aquifer near Memphis, Tennessee	■	384	52	91.84	107.62 (1988)	[1]109.14
	HIGH WATER LEVELS						
	ALLUVIAL BASINS (2)						
332615104303601	Roswell Basin aquifer at Roswell, New Mexico	■	324	26	63.13	41.10 (1992)	40.80
	COLORADO PLATEAU AND WYOMING BASIN (4)						
351651107594501	San Andres-Yeso aquifer at Bluewater, New Mexico	▤	505	47	106.16	98.77 (1990)	98.13
	NONGLACIATED CENTRAL REGION (6)						
385604080495701	Upper Pennsylvanian aquifer near Glenville, West Virginia	○	25	39	16.69	11.36 (1992)	[2]10.50
	GLACIATED CENTRAL REGION (7)						
414315091252002	Devonian aquifer near Morse, Iowa	▤	82	52	16.64	12.28 (1962)	11.94
421837094083601	Unconsolidated glacial drift aquifer near Harcourt, Iowa	⊜	42	51	4.62	2.33 (1992)	2.24
422803087475304	Ironton–Galesville aquifer at Illinois Beach State Park, Illinois	■	1,203	4	233.00	231.57 (1991)	[2]222.50
425410084323501	Shallow drift aquifer near Dewitt, Michigan	○	26	44	17.39	15.96 (1969)	15.92
	PIEDMONT AND BLUE RIDGE (8)						
355359080331701	Weathered granite aquifer near Mocksville, North Carolina	○	31	11	18.06	15.54 (1991)	14.55
390006095132301	Newman Terrace deposits aquifer near Lawrence, Kansas	⊜	53	41	20.67	16.27 (1969)	[2]12.69

[1] All–time month–end low.

[2] All–time month–end high.

above last months. Levels were below long-term averages in Georgia and Maryland; generally above long-term averages in New Jersey and North Carolina; and mixed with respect to average in Pennsylvania and Virginia. A monthly high occurred in the weathered granite aquifer well near Mocksville, North Carolina (for the ninth consecutive time).

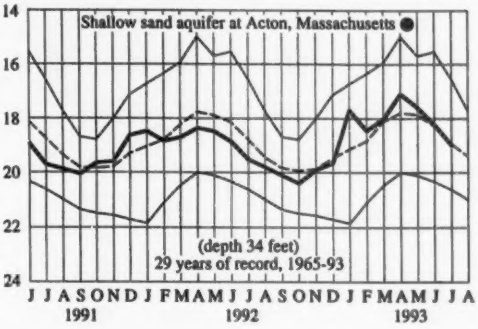
In the Northeast and Superior Uplands region, levels were generally above last month's in Minnesota and below last month's levels elsewhere. Water levels were above average in Michigan, Minnesota, and New York, but were below average elsewhere. A monthly high occurred in the stratified drift aquifer well near West Fairlee Village, Vermont (for the first time this year).

In the Atlantic and Gulf Coastal Plain region, water levels were below last month's except in Virginia, where levels were mixed with respect to last month's. Levels were above long-term averages in Texas, Massachusetts, and Kentucky; mixed in New Jersey and South Carolina; and below average elsewhere. All-time lows occurred in wells in the Upper Potomac aquifer near Toana, Virginia (following eight monthly lows); the Memphis sand aquifer near Memphis, Tennessee (for the first time this year); and the Mississippi Valley alluvial aquifer near Lonoke, Arkansas (for the first time this year). Monthly lows occurred for the tenth consecutive month in the sand and gravel aquifer well at Ensley, Florida and in the Sparta aquifer well near Ruston, Louisiana. A monthly low occurred in the Upper Potomac-Raritan-Magothy aquifer system well near Medford, New Jersey (for the third consecutive month).

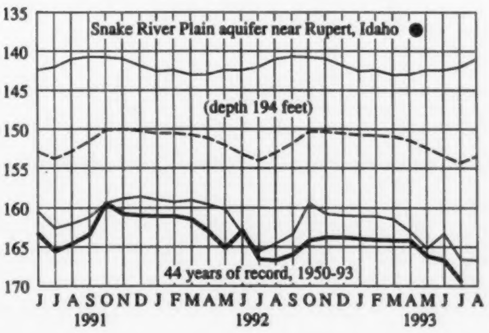
In the Southeast Coastal Plain region, water levels were mixed with respect to last month's and with respect to long-term averages.

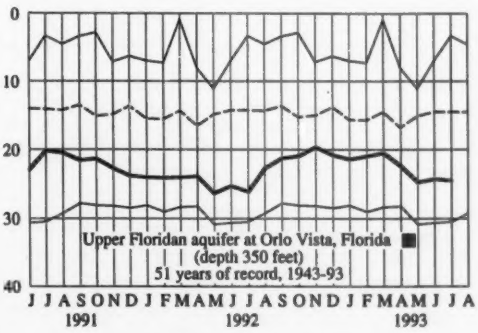
MONTHEND GROUND-WATER LEVELS IN SELECTED WELLS

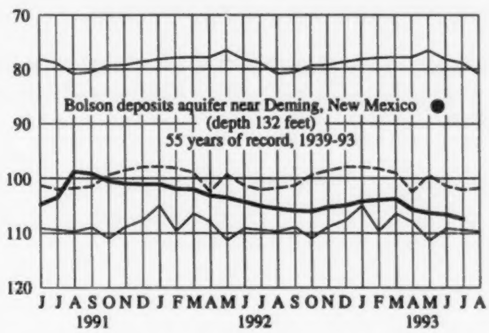
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.

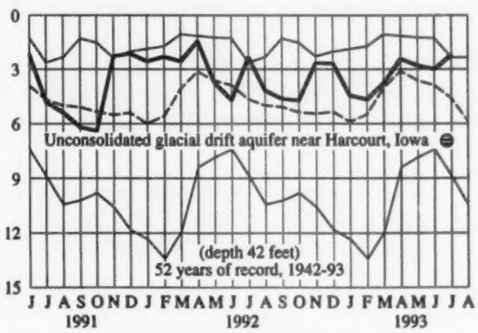


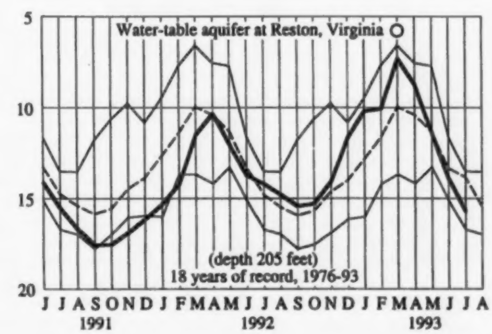
WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM

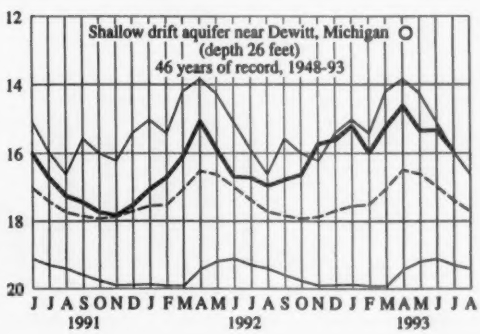




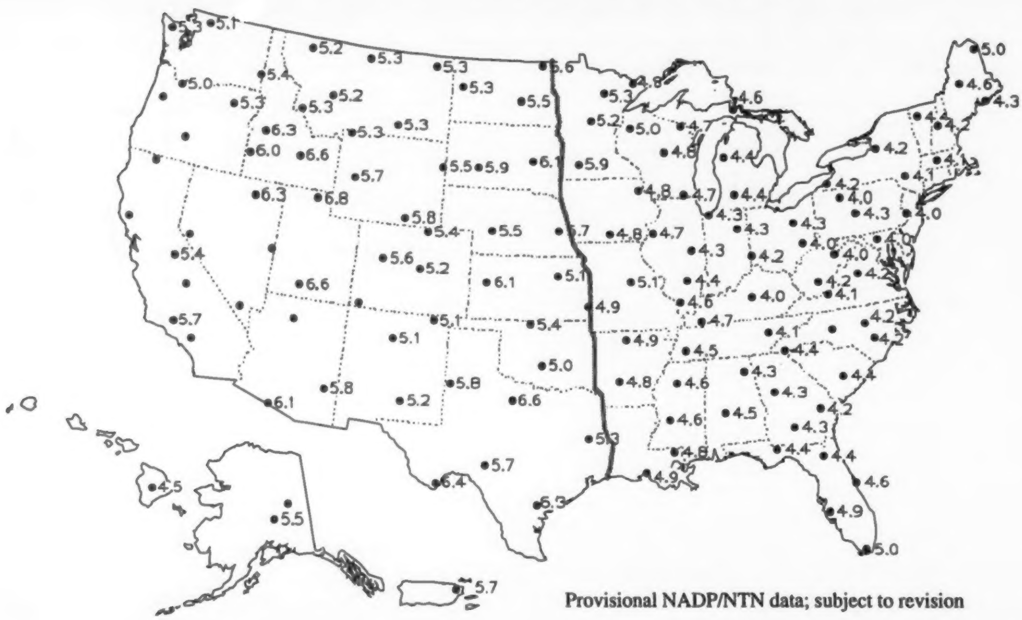








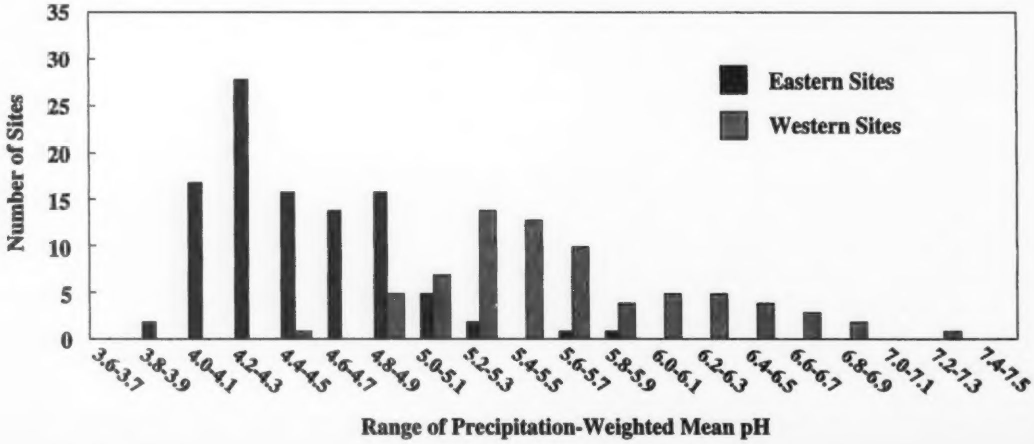
pH of Precipitation for June 21-July 25, 1993



Current pH data shown on the map (• 4.9) are precipitation-weighted means calculated from preliminary laboratory results provided by the NADP/NTN Central Analytical Laboratory at the Illinois State Water Survey and are subject to change. The 128 points (•) shown on this map represent a subset of all sites chosen to provide relatively even geographic spacing. Absence of a pH value at a site indicates either that there was no precipitation or that data for the site did not meet preliminary screening criteria for this provisional report.

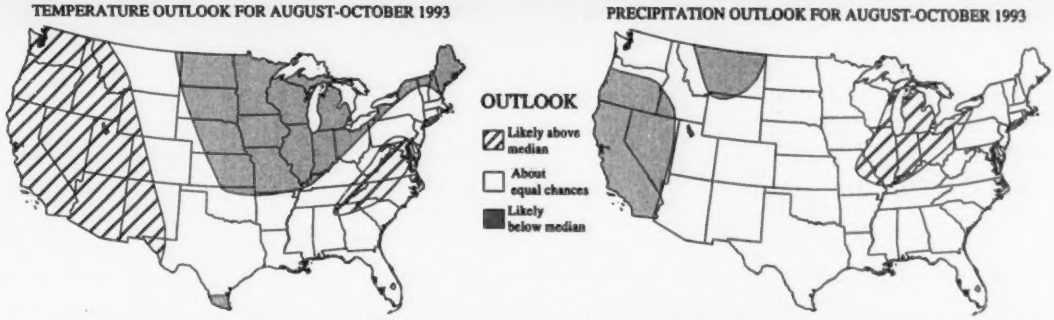
A list of the approximately 200 sites comprising the total Network and additional data for the sites are available from the NADP/NTN Coordination Office, Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO 80523.

Distribution of precipitation-weighted mean pH for all NADP/NTN sites having one or more weekly samples for June 21-July 25, 1993. The East/West dividing line is at the western borders of Minnesota, Iowa, Missouri, Arkansas, and Louisiana.



TEMPERATURE OUTLOOK FOR AUGUST-OCTOBER 1993

PRECIPITATION OUTLOOK FOR AUGUST-OCTOBER 1993



Adapted from *Monthly and Seasonal Weather Outlook* prepared and published by the National Weather Service

NATIONAL WATER CONDITIONS

JULY 1993

Based on reports from the Canadian and U.S. Field offices; completed October 5, 1993

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EXPLANATION OF DATA (Revised September 1993)

Cover map shows generalized pattern of streamflow for the month based on provisional data from 186 index gaging stations—18 in Canada, 166 in the United States, and 2 in the Commonwealth of Puerto Rico. Alaska, Hawaii, and Puerto Rico inset maps show streamflow only at the index gaging stations that are located near the point shown by the arrows. Classifications on map are based on comparison of streamflow for the current month at each index station with the flow for the same month in the 30-year reference period, 1961-90. Shorter reference periods are used for one index station in Utah and both of the Puerto Rico index stations. Streamflow data presented herein are those published in the annual series of U.S. Geological Survey reports titled *Water Resources Data* (State) through the end of the 1991 water year—September 30, 1991. All other data are provisional.

The ***streamflow ranges map*** shows where streamflow has persisted in the above- or below-normal range from last month to this month and also where streamflow is in the above- or below-normal range this month after being in a different range last month. Three ***pie charts*** show the percent of stations reporting discharges in each flow range for both the conterminous United States and southern Canada, and also the percent of area in each flow range for the conterminous United States and southern Canada. The ***combination bar/line graph*** shows the monthly percent departure of the total mean from the total median flow (1961-90) and the cumulative monthly departure from median for all reporting stations (excluding seven large river stations indicated by # in the ***Flow of large rivers*** table and French Broad River near Newport, Tennessee) in the conterminous United States and southern Canada. Graphs for individual hydrologic basins exclude the same stations.

The comparative data are obtained by ranking the 30 flows for each month of the reference period in order of decreasing magnitude—the highest flow is given a ranking of 1 and the lowest flow is given a ranking of 30. Quartiles (25-percent points) are computed by weighted averaging of the 7th and 8th highest flows (upper quartile), 15th and 16th highest flows (middle quartile or median), and the 23rd and 24th highest flows (lower quartile). The upper and lower quartiles set off the highest and lowest 25 percent of flows, respectively, for the reference period. The median (middle quartile) is the middle value by definition. For the reference period, 50 percent of the flows are greater than the median, 50 percent are less than the median, 50 percent are between the upper and lower quartiles (in the normal range), 25 percent are greater than the upper quartile (above normal), and 25 percent are less than the lower quartile (below normal). Flow for the current month is then classified as: in the ***above-normal range*** if it is greater than the upper quartile, in the ***normal range*** if it is between the upper and lower quartiles, and in the ***below-normal range*** if it is less than the lower quartile. Change in flow from the previous month to the current month is classified as ***seasonal*** if the change is in the same direction as the change in the median. If the change is in the opposite direction of the change in the median, the change is classified as ***contraseasonal.*** For example: at a particular index station, the January median is greater than the December median; if flow for the current January increased from December (the previous month), the increase is seasonal; if flow for the current January decreased from December, the decrease is contraseasonal.

Flood frequency analyses define the relation of flood peak magnitude to probability of occurrence or recurrence interval. ***Probability of occurrence*** is the chance that a given flood magnitude will be exceeded in any one year. ***Recurrence interval*** is the reciprocal of probability of occurrence and is the average number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. ***Recurrence intervals imply no regularity of occurrence***; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about ***ground-water levels*** refer to conditions near the end of the month. The water level in each observation well is compared with average level for the end of the month determined from the entire period of record for that well. ***Changes in ground-water levels***, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data are given for four stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). ***Dissolved solids*** are minerals dissolved in water and usually consist predominately of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. ***Dissolved-solids discharge*** represents the total daily amount of dissolved minerals carried by the stream. ***Dissolved-solids concentrations*** are generally higher during periods of low streamflow, but the highest dissolved-solids discharges occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at times of low flow.

FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM UNITS (SI)

Multiply inch-pound units	By	To obtain SI units
	Length	
inches	2.54×10^{1}	millimeters (mm)
	2.54×10^{-2}	meters (m)
feet	3.048×10^{-1}	meters (m)
miles	1.609×10^{3}	kilometers (km)
	Area	
square miles	2.590×10^{0}	square kilometers (km^2)
	Volume	
acre-feet (acre-feet)	1.233×10^{-3}	cubic hectometers (hm^3)
	1.233×10^{-6}	cubic hectometers (km^3)
	Flow	
cubic feet per second (ft^3/s)	2.832×10^{-2}	cubic meters per second (m^3/s)

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DEPARTMENT OF THE INTERIOR
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